CHAPTER • TWENTY

PONTIC DESIGN

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KEY TERMS

conical pontic
crest
emergence profile
hygienic pontic
modified ridge lap pontic
ovate pontic
residual ridge
residual ridge resorption
ridge augmentation
ridge lap
sanitary pontic

Pontics are the artificial teeth of a fixed partial denture that replace missing natural teeth, restoring function and appearance. They must be compatible with continued oral health and comfort. The edentulous areas where a fixed prosthesis is to be provided may be overlooked during the treatment-planning phase. Unfortunately, any deficiency or potential problem that may arise during the fabrication of a pontic is often identified only after the teeth have been prepared or even when the master cast is ready to be sent to the laboratory. Proper preparation includes a careful analysis of the critical dimensions of the edentulous areas: mesiodistal width, occlusocervical distance, buccolingual diameter, and location of the **residual ridge.** To design a pontic that will meet hygienic requirements and prevent irritation of the residual ridge, particular attention must be given to the form and shape of the gingival surface. Merely replicating the form of the missing tooth or teeth is not enough. The pontic must be carefully designed and fabricated not only to facilitate plaque control of the tissue surface and around the adjacent abutment teeth but also to adjust to the existing occlusal conditions. In addition to these biologic considerations, pontic design must incorporate mechanical principles for strength and longevity as well as esthetic principles for satisfactory appearance of the replacement teeth (Fig. 20-1).

The pontic, as it mechanically unifies the abutment teeth and covers a portion of the residual ridge, assumes a dynamic role as a component of the prosthesis and cannot be considered as a lifeless insert of gold, porcelain, or acrylic.'

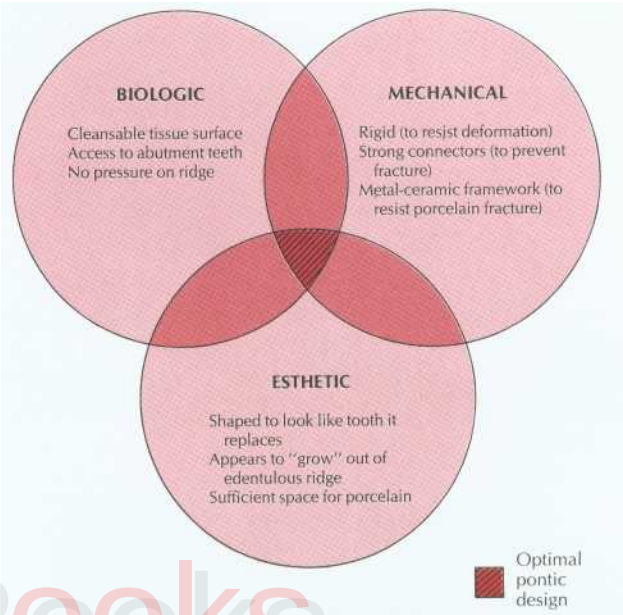


Fig. 20-1. Biologic, mechanical, and esthetic considerations for successful pontic design.

PRETREATMENT ASSESSMENT

Certain procedures will enhance the success of a fixed partial denture (FPD). In the treatment-planning phase, diagnostic casts and waxing procedures may prove especially valuable for determining optimal pontic design (see Chapters 2 and 3).

PONTIC SPACE

One function of an FPD is to prevent tilting or drifting of the adjacent teeth into the edentulous space. If such movement has already occurred, the space available for the pontic may be reduced and its fabrication complicated. At this point, creating an acceptable appearance without orthodontic repositioning of the abutment teeth is often impossible, particularly if esthetics is important. (Modification of abutments with complete-coverage retainers is sometimes feasible.) Careful diagnostic waxing procedures will help determine the most appropriate treatment (see Chapters 2 and 3). Even with a lesser

esthetic requirement, as for posterior teeth, overly small pontics are unacceptable because they trap food and are difficult to clean. When orthodontic repositioning is not possible, increasing the proximal contours of adjacent teeth may be better than making an FPD with undersized pontics (Fig. 20-2). If there is no functional or esthetic deficit, the space can be maintained without prosthodontic intervention.

RESIDUAL RIDGE CONTOUR

The edentulous ridge's contour and topography should be carefully evaluated during the treatment-planning phase. An ideally shaped ridge has a smooth, regular surface of attached gingiva, which facilitates maintenance of a plaque-free environment. Its height and width should allow placement of a pontic that appears to emerge from the ridge and mimics the appearance of the neighboring teeth. Facially, it must be free of frenum attachment and of adequate facial height to sustain the appearance of interdental papillae.

Loss of residual ridge contour may lead to unesthetic open gingival embrasures ("black triangles") (Fig. 20-3, A), food impaction (Fig. 20-3, B), and percolation of saliva during speech. Siebert2 has classified residual ridge deformities into three categories (Fig. 20-4):

- Class I defects-faciolingual loss of tissue width with normal ridge height
- Class II defects-loss of ridge height with normal ridge width
- Class III defects-a combination of loss in both dimensions

There is a high incidence (91%) of residual ridge deformity following anterior tooth loss3; the majority of these are Class III defects. Because patients with Class II and III defects are frequently dissatisfied with the esthetics of their FPDs,4 preprosthetic surgery to augment the residual ridge should be carefully considered.

SURGICAL MODIFICATION

Although residual ridge width may be augmented with hard tissue grafts, this is usually not indicated unless the edentulous site is to receive an implant (see Chapter 13).

Class I Defects. Soft tissue procedures have been advocated for improving the width of a Class

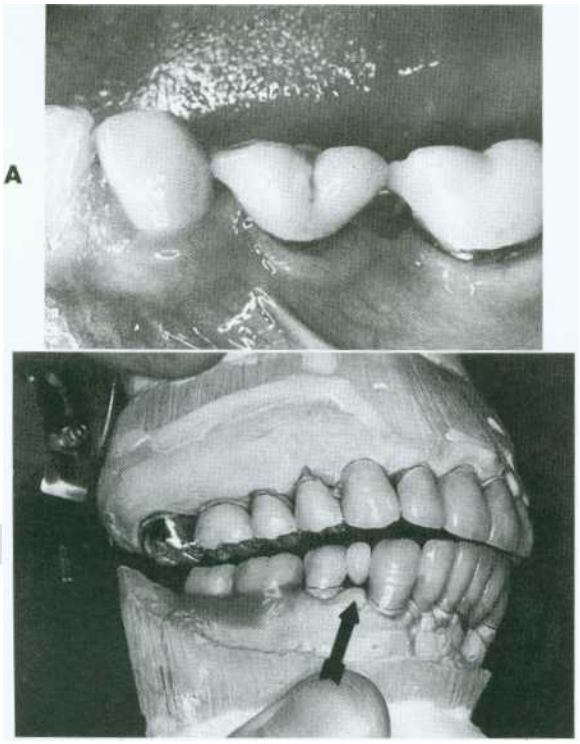


Fig. 20-2. Careful planning is always necessary when deciding how to restore an undersized pontic space where orthodontic treatment is not practical. A, In this patient, individual crowns of increased proximal contours were preferred to an FPD with undersized pontics. Excellent plaque control had been demonstrated, and the design provided the optimum occlusal relationship. B, Here a small pontic (arrow) was preferred to splint an RPD abutment.

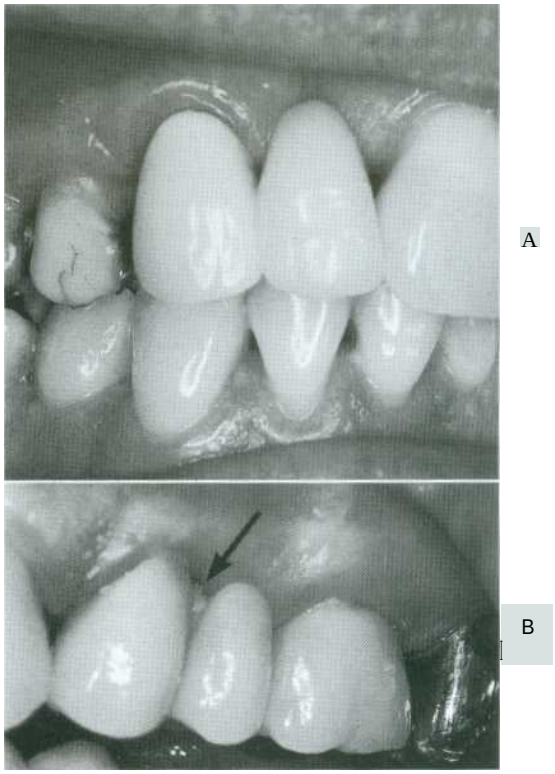


Fig. 20-3. Loss of residual ridge contour leading to unesthetic open gingival embrasures (A) and food entrapment (arrow) (B).

I defect; however, because Class I defects are infrequent and are not esthetically challenging, surgical augmentation of ridge width is uncommon. Paying careful attention to provisional pontic contour will help the operator identify patients who would benefit from surgery. The rolls technique uses soft tissue from the lingual side of the edentulous site. The epithelium is removed, and the tissue is thinned and rolled back upon itself, thereby thickening the facial aspect of the residual ridge (Fig. 20-5). Pouches[6] may also be prepared in the facial aspect of the residual ridge, into which subepithelial[7,8] or submucosal[9] grafts harvested from the palate or tuberosity may be inserted (Fig. 20-6).

Class II and III Defects. Unfortunately, few soft tissue surgical techniques can increase the height of a residual ridge with any predictability. The interpositional graft[2] is a variation of the pouch technique, in which a wedge-shaped connective tissue graft is inserted into a pouch preparation on the facial aspect of the residual ridge. The epithelial portion of the wedge may be positioned coronally to the surrounding epithelium if an increase of ridge height is desired (Fig. 20-7 A and B). The onlay graft is designed to gain ridge height [2,11] but also contributes to ridge width, which makes it useful for treating Class III ridge defects. It is a thick "free gingival graft" harvested from partial- or full-thickness palatal donor sites. Since the amount of height augmentation can only be as thick as the graft, the procedure may have to be repeated several times to reestablish normal residual ridge height. Although the onlay graft has greater potential for increasing ridge height compared to the interpositional graft, its survival is greatly dependent on revascularization, which requires meticulous preparation of the recipient site (Fig. 20-5). Therefore, it is more technique sensitive than the interpositional graft.

GINGIVAL ARCHITECTURE PRESERVATION

Although the degree of **residual ridge resorption** following tooth extraction is unpredictable, resulting deformities are not an inevitable occurrence. Preservation of the alveolar process can be achieved through immediate restorative and periodontal intervention at the time of tooth removal. By conditioning the extraction site and providing a matrix for healing, the pre-extraction gingival architecture (or "socket") can be preserved.

Preparing the abutment teeth before the extraction is the preferred technique. A provisional FPD can be fabricated indirectly, ready for immediate insertion. Because socket preservation is dependent on underlying bone contour, the extraction of the tooth to be replaced should be atraumatic and aimed at preserving the facial plate of bone. The scalloped architecture of interproximal bone forming the extraction site is essential for proper papilla form, as are facial bone levels in the prevention of alveolar collapse. If bone levels are compromised

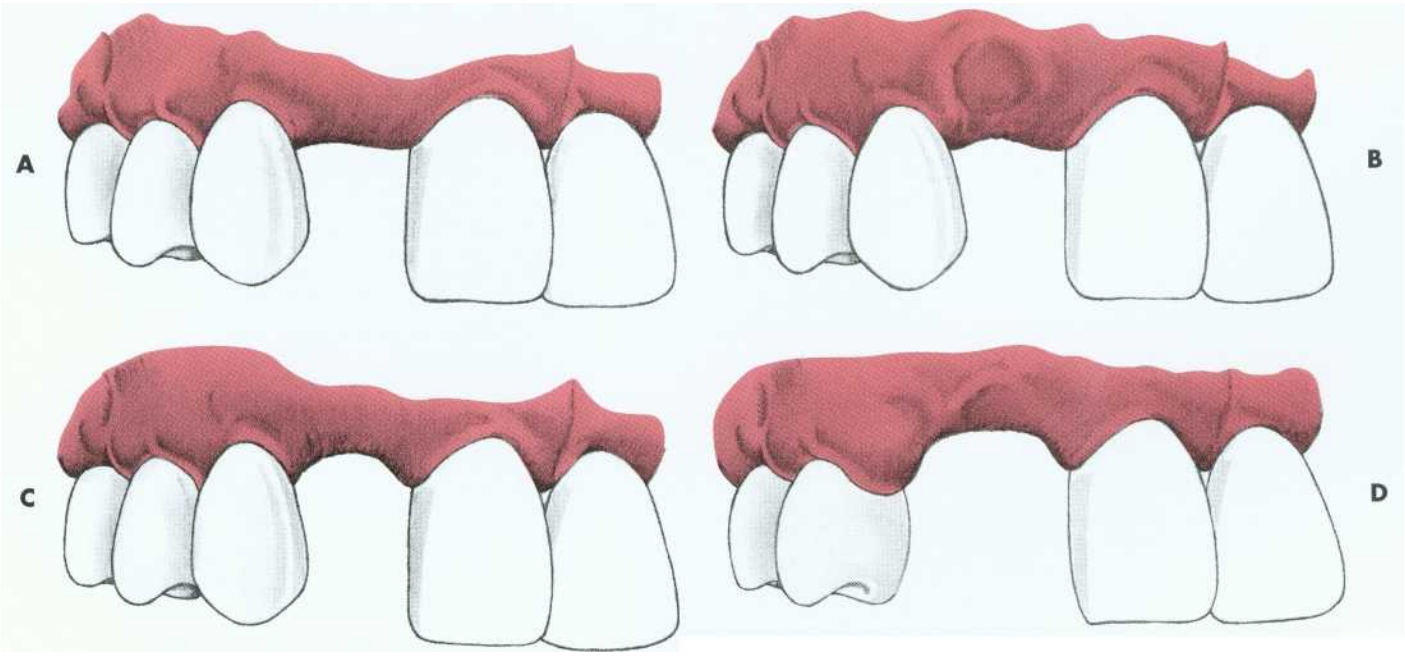


Fig. 20-4. Residual ridge deformities as classified by Siebert.[2] A, B, Class I defect. C, Class II defect. D, Class III defect.

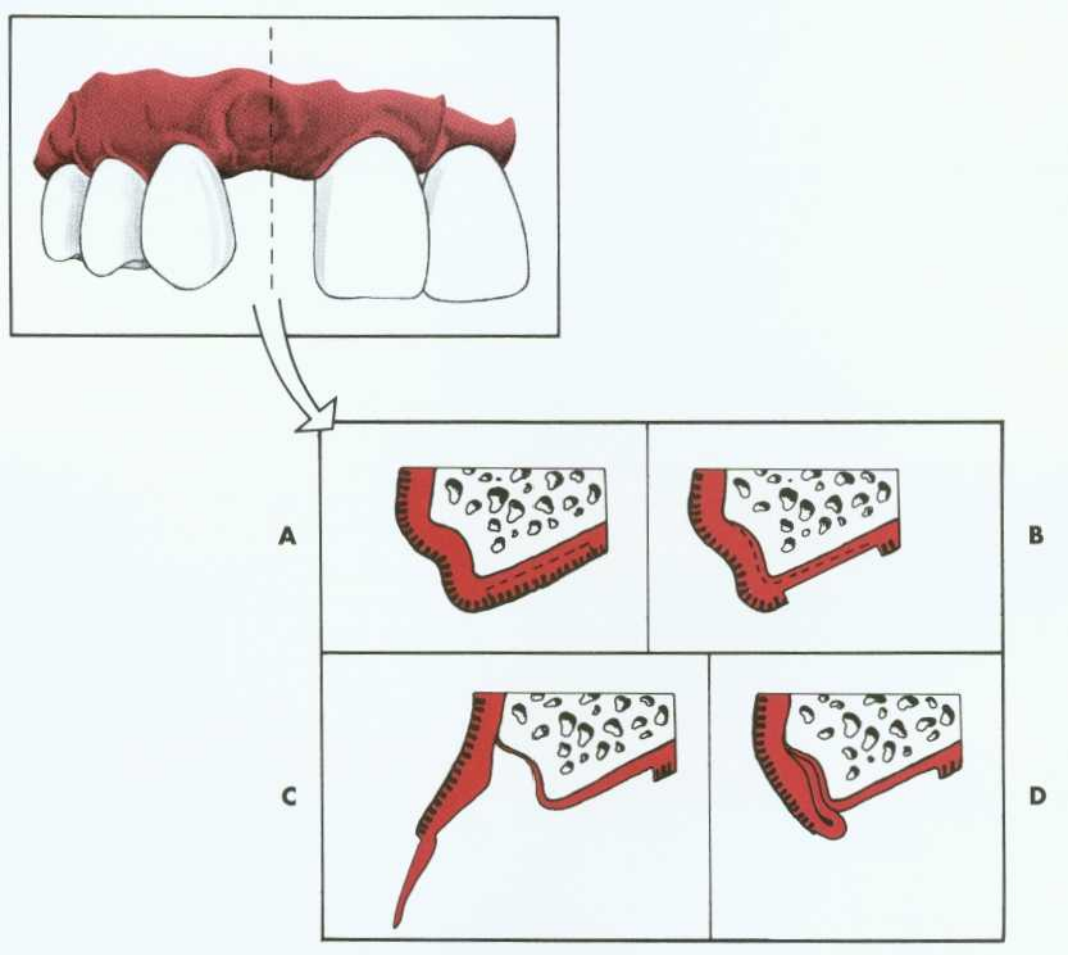


Fig. 20-5. The roll technique for soft tissue ridge augmentation. A, Cross section of Class I residual ridge defect before augmentation. B, Epithelium removed from palatal surface. C, Elevation of flap, creating a pouch on the vestibular surface. D, The flap is rolled into the pouch, enhancing ridge width.

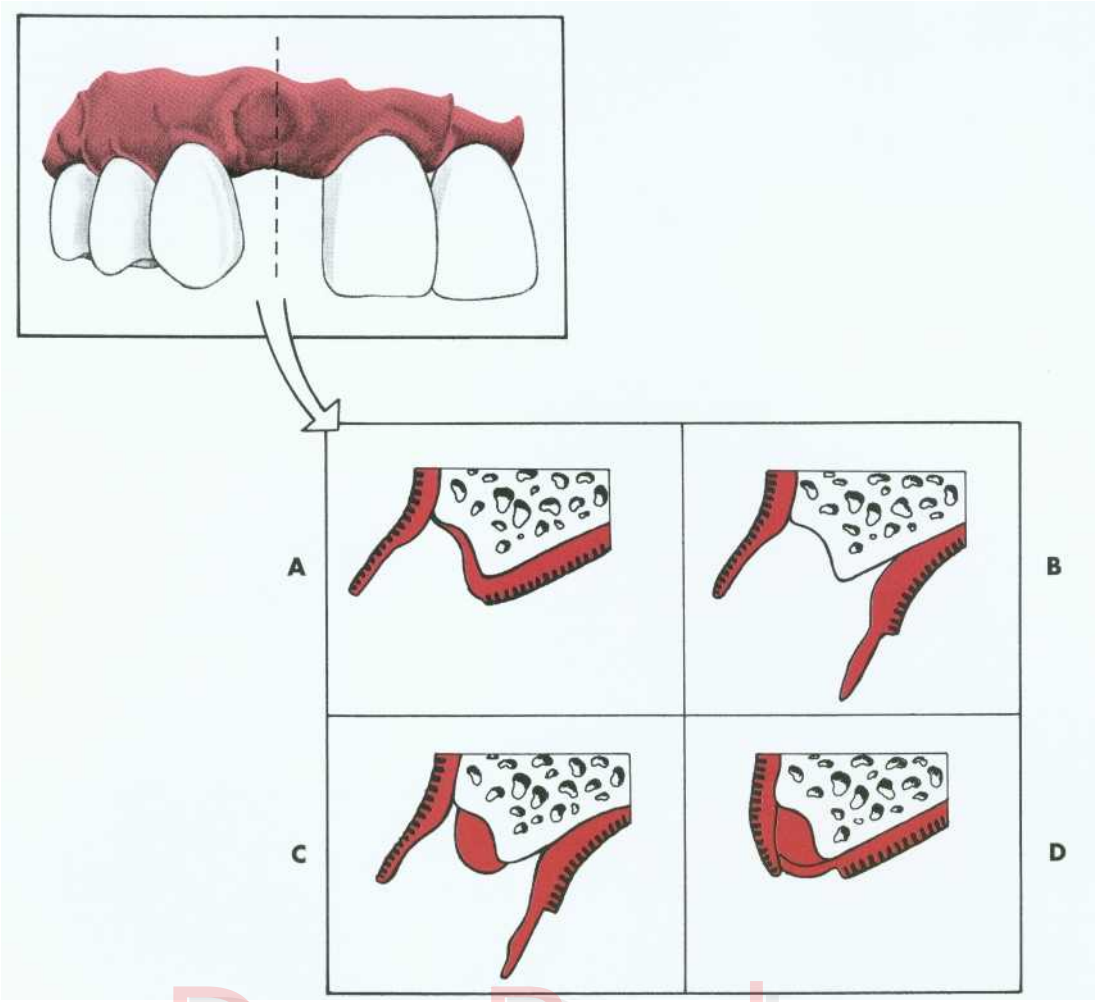


Fig. 20-6. The pouch technique for soft tissue ridge augmentation. A and B, Split-thickness flap is reflected. C, Graft material placed in the pouch increases ridge width. D, Flaps sutured in place.

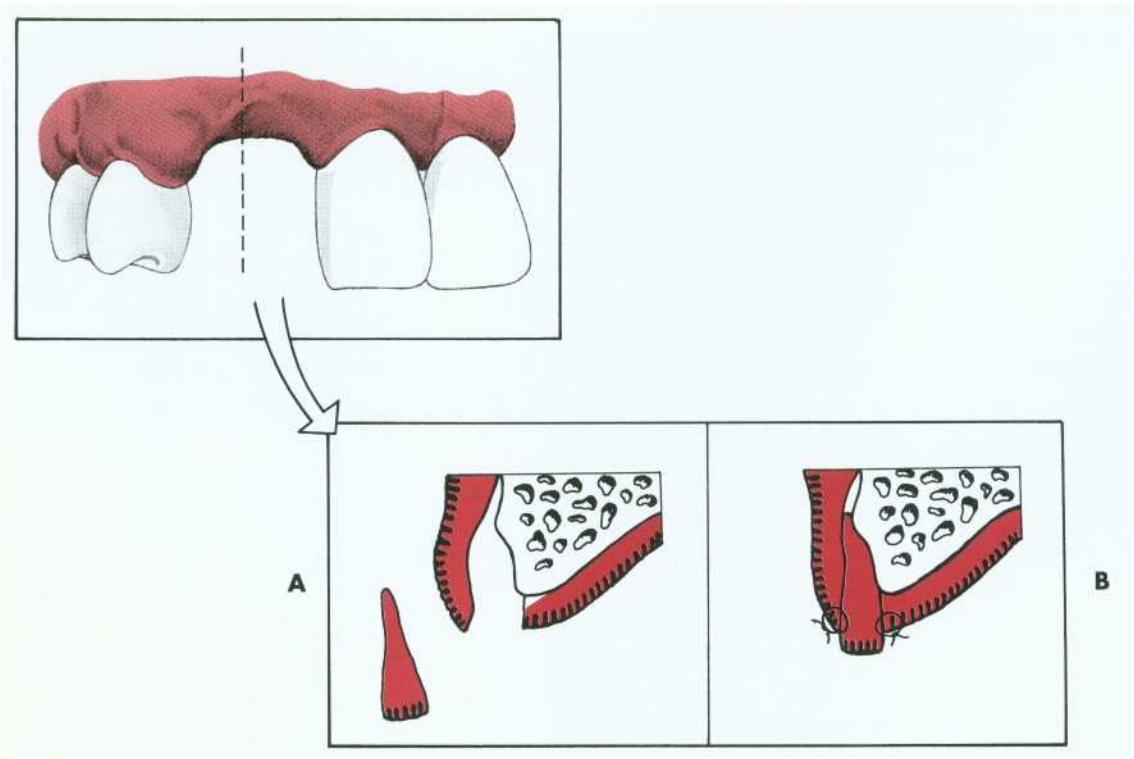


Fig. 20-7. An interpositional graft for augmentation of ridge width and height. A, Tissue reflected. B, Graft positioned and sutured in place.

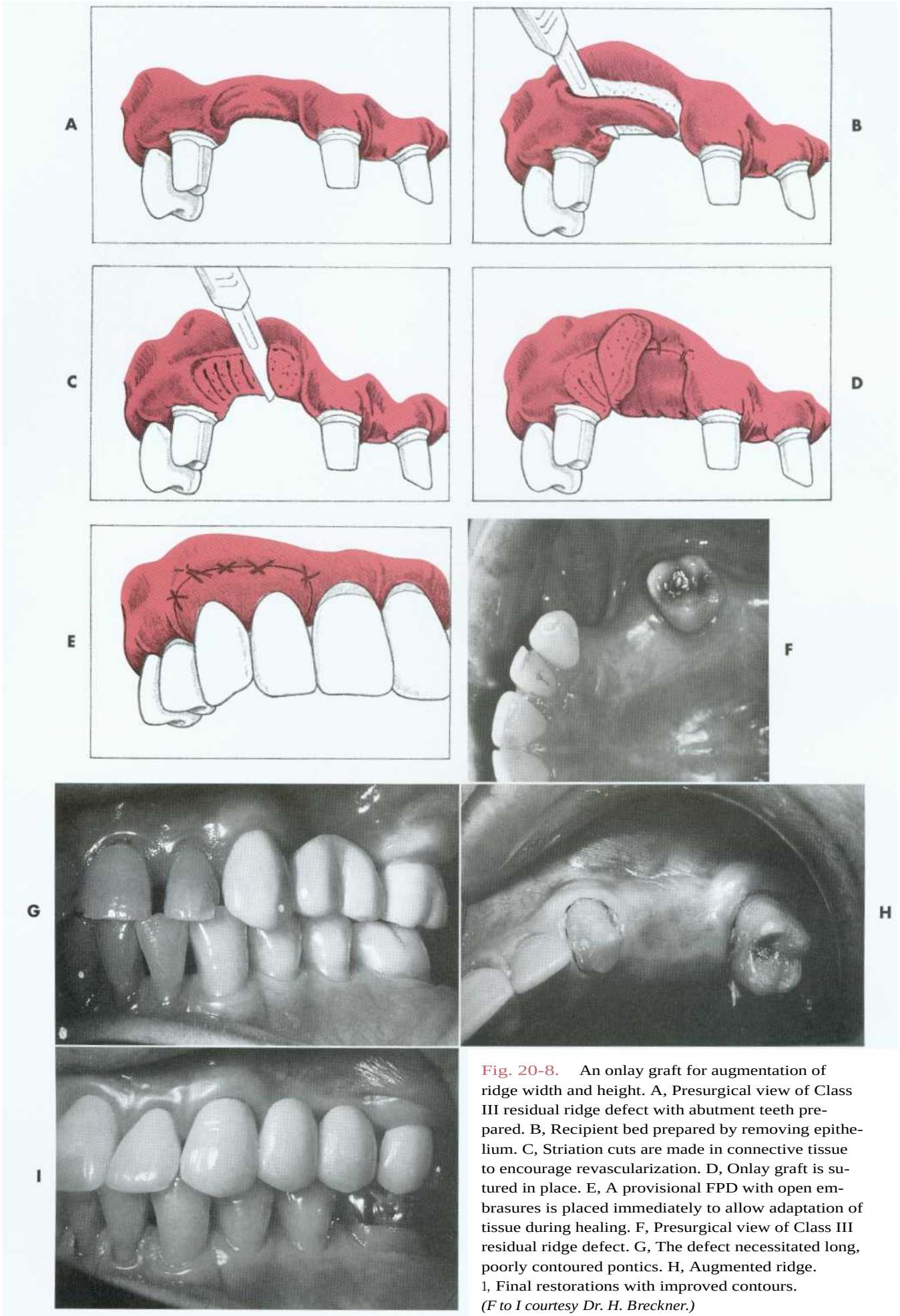


Fig. 20-8. An onlay graft for augmentation of ridge width and height. A, Presurgical view of Class III residual ridge defect with abutment teeth prepared. B, Recipient bed prepared by removing epithelium. C, Striation cuts are made in connective tissue to encourage revascularization. D, Onlay graft is sutured in place. E, A provisional FPD with open embrasures is placed immediately to allow adaptation of tissue during healing. F, Presurgical view of Class III residual ridge defect. G, The defect necessitated long, poorly contoured pontics. H, Augmented ridge. 1, Final restorations with improved contours. *(F to I courtesy Dr. H. Breckner.)*

before or **during extraction, the sockets can be grafted with an allograft material (hydroxyapatite, tricalcium phosphate, or freeze-dried bone)** .12-14

Immediately after preparation of the extraction site, a carefully shaped provisional FPD is placed (Fig. 20-9, A and B). The tissue-side of the pontic should be an ovate form, and according to Spear, 's it should extend approximately 2.5 mm apical to the facial free gingival margin of the extraction socket (Fig. 20-9, C and D). Because the soft tissues of the socket will begin to collapse immediately after the tooth extraction, the pontic will result in tissue blanching as it supports the papillae and facial/palatal gingiva. The contour of the ovate tissue-side of the **pontic is critical and must conform to within 1 mm of the interproximal and facial bone contour to** act as a template for healing. Oral hygiene in **this area is difficult during the initial healing period, so the provisional should be highly** polished to minimize plaque retention. After approximately 1 month of healing, oral hygiene access is improved by recontouring the pontic to provide 1 to 1.5 mm of relief from the tissue. When the gingival levels are stable (approximately 6 to 12 months), the final restoration can be fabricated (Fig. 20-9, E).

Although maintenance of the residual ridge following extraction is meritorious, socket-preservation techniques are technically challenging and require frequent patient monitoring and conscientious patient hygiene. Even when the procedure is performed meticulously, success is unpredictable because of the variability of patient healing response. **Additional surgical augmentation of the ridge may still** be **necessary for some patients.**

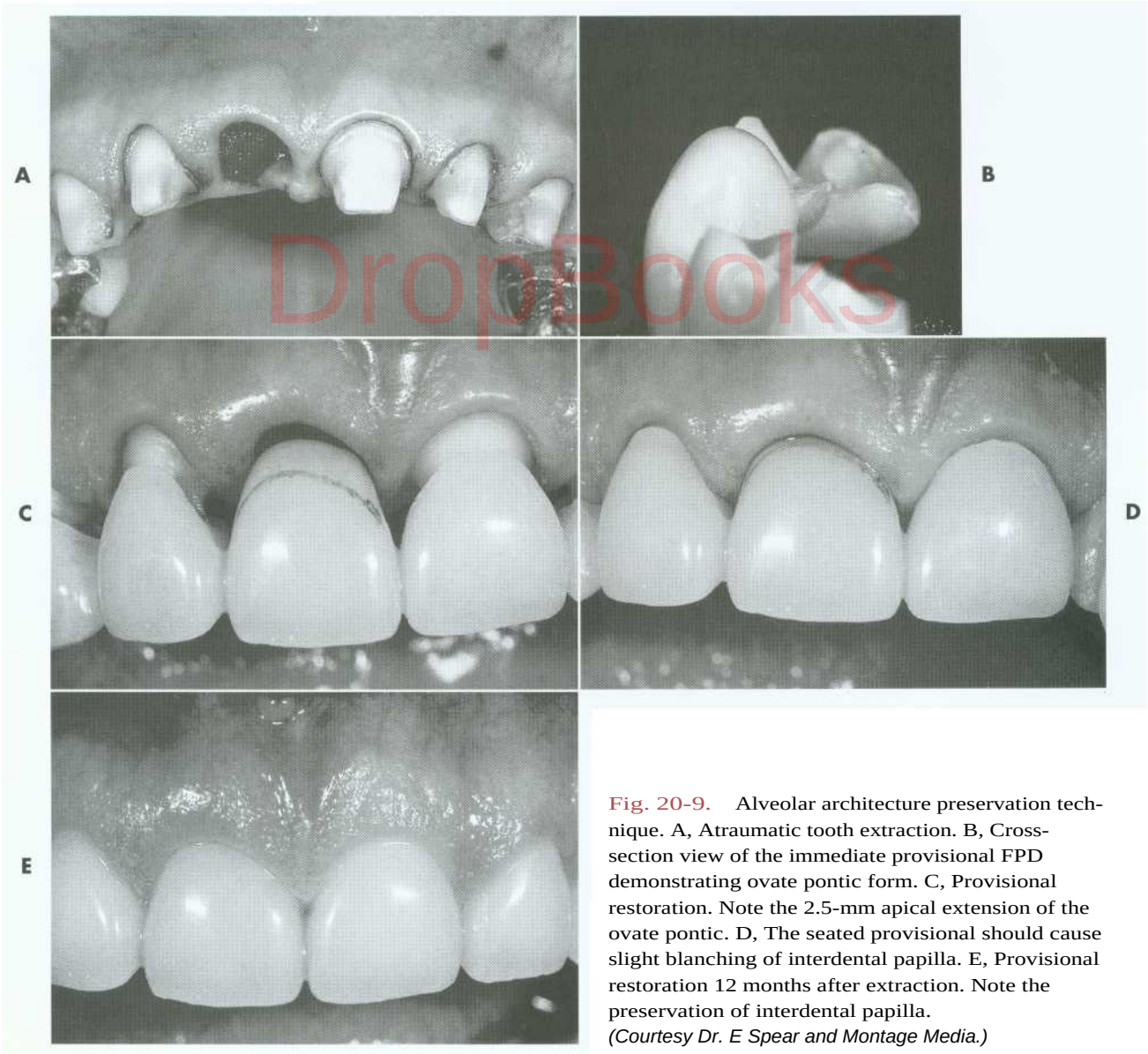


Fig. 20-9. Alveolar architecture preservation technique. A, Atraumatic tooth extraction. B, Cross-section view of the immediate provisional FPD demonstrating ovate pontic form. C, Provisional restoration. Note the 2.5-mm apical extension of the ovate pontic. D, The seated provisional should cause slight blanching of interdental papilla. E, Provisional restoration 12 months after extraction. Note the preservation of interdental papilla.
(Courtesy Dr. E Spear and Montage Media.)

PONTIC CLASSIFICATION

Pontic designs are classified into two general groups: those that contact the oral mucosa and those that do not (Box 20-1). There are several classifications within these groups, based on the shape of the gingival side of the pontic. Pontic selection depends primarily on esthetics and oral hygiene. In the anterior region, where esthetics is a concern, the pontic should be well adapted to the tissue to make it appear that it emerges from the gingiva. Conversely, in the posterior regions (mandibular premolar and molar areas), esthetics can be compromised in the interest of designs that are more amenable to oral hygiene. The advantages and disadvantages of the various pontic designs are summarized in Table 20-1.

PONTIC DESIGN CLASSIFICATION BOX 20-1

A. Mucosal contact
1. Ridge lap
2. Modified ridge lap
3. Ovate
4. Conical

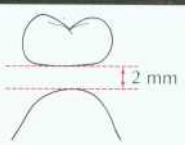
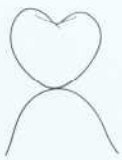
B. No mucosal contact
1. Sanitary (hygienic)
2. Modified sanitary (hygienic)

SANITARY OR HYGIENIC PONTIC

As its name implies, the primary design feature of the **sanitary pontic** allows easy cleaning, because its tissue surface remains clear of the residual ridge (Fig. 20-10). This hygienic design permits easier

Fig. 20-10. A "hygienic" or "sanitary" pontic replacing a mandibular molar where there has been considerable bone loss.

Pontic Designs

Pontic Design		Recommended Location	Advantages	Disadvantages
Sanitary/hygienic		Posterior mandible	Good access for oral hygiene	Poor esthetics
Saddle-ridge-lap		Not recommended	Esthetic	Not amenable to oral hygiene
Conical		Molars without esthetic requirements	Good access for oral hygiene	Poor esthetics
Modified ridge-lap		High esthetic requirement (i.e., anterior teeth and premolars, some maxillary molars)	Good esthetics	Moderately easy to clean
Ovate		Maxillary incisors cuspids and premolars	Superior esthetics Negligible food entrapment Ease of cleaning	Requires surgical preparation

plaque control by allowing gauze strips and other cleaning devices to be passed under the pontic and seesawed in shoe-shine fashion. Its disadvantages include entrapment of food particles, which may lead to tongue habits that may annoy the patient. The **hygienic pontic** is the least "toothlike" design and is therefore reserved for teeth seldom displayed during function (i.e., the mandibular molars).

A modified version of the sanitary pontic has been developed .16 Its gingival portion is shaped like an archway between the retainers. This geometry permits increased connector size while decreasing the stress concentrated in the pontic and connectors." It is also less susceptible to tissue proliferation that can occur when a pontic is too close to the residual ridge (Fig. 20-11).

SADDLE OR RIDGE LAP PONTIC

The saddle pontic has a concave fitting surface that overlaps the residual ridge buccolingually, simulating the contours and **emergence profile** of the missing tooth on both sides of the residual ridge. However, saddle or **ridge lap** designs should be avoided because the concave gingival surface of the pontic is not accessible to cleaning with dental floss, which will lead to plaque accumulation (Fig. 20-12). This design deficiency has been shown to result in tissue inflammation' (Fig. 20-13).

MODIFIED RIDGE LAP PONTIC

The **modified ridge lap pontic** combines the best features of the hygienic and saddle pontic designs, combining esthetics with easy cleaning. Figs. 20-14 and 20-15 demonstrate how the modified ridge lap design overlaps the residual ridge on the facial (to achieve the appearance of a tooth emerging from the gingiva) but remains clear of the ridge on the lingual. To enable optimal plaque control, the gingival surface must have no depression or hollow. Rather, it should be as convex as possible from mesial to distal (the greater the convexity, the easier the oral hygiene). Tissue contact should resemble a letter T (Fig. 20-16) whose vertical arm ends at the **crest** of the ridge. Facial ridge adaptation is

TABLE 20-1

Indications	Contraindications	Materials
Nonesthetic zones Impaired oral hygiene	Where esthetics is important Minimal vertical dimension	All metal
Not recommended	Not recommended	N/A
Posterior areas where esthetics is of minimal concern	Poor oral hygiene	All-metal Metal-ceramic All-resin
Most areas with esthetic concern	Where minimal esthetic concern exists	Metal-ceramic All-resin
Desire for optimal esthetics High smile line	Unwillingness for surgery	Metal-ceramic All-resin

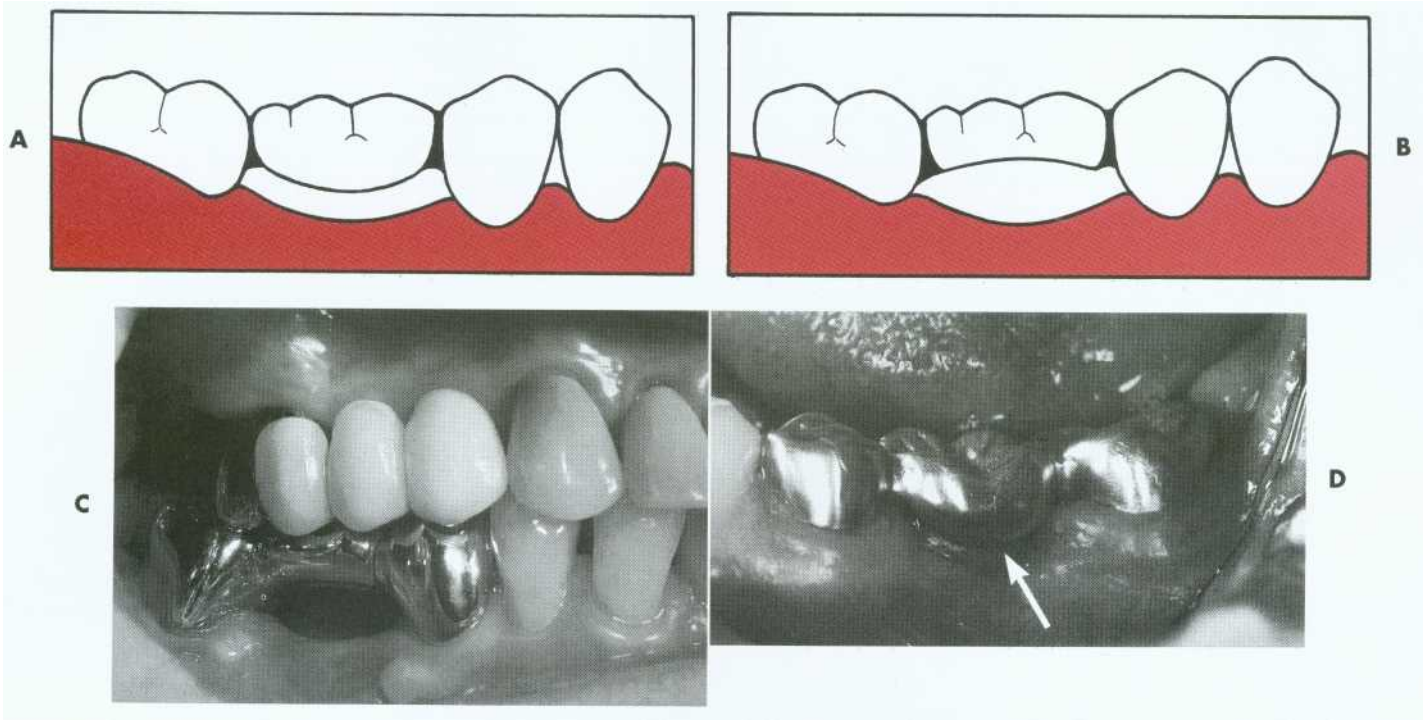
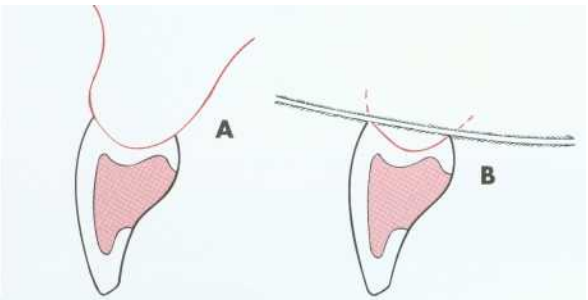


Fig. 20-11. A, Sanitary pontic. B and C, Modified sanitary pontic. D, Placement of the pontic, close to the ridge, has resulted in tissue proliferation (arrow).

Fig. 20-12. A, Cross-section view of ridge lap pontic. B, The tissue surface is inaccessible to cleaning devices.



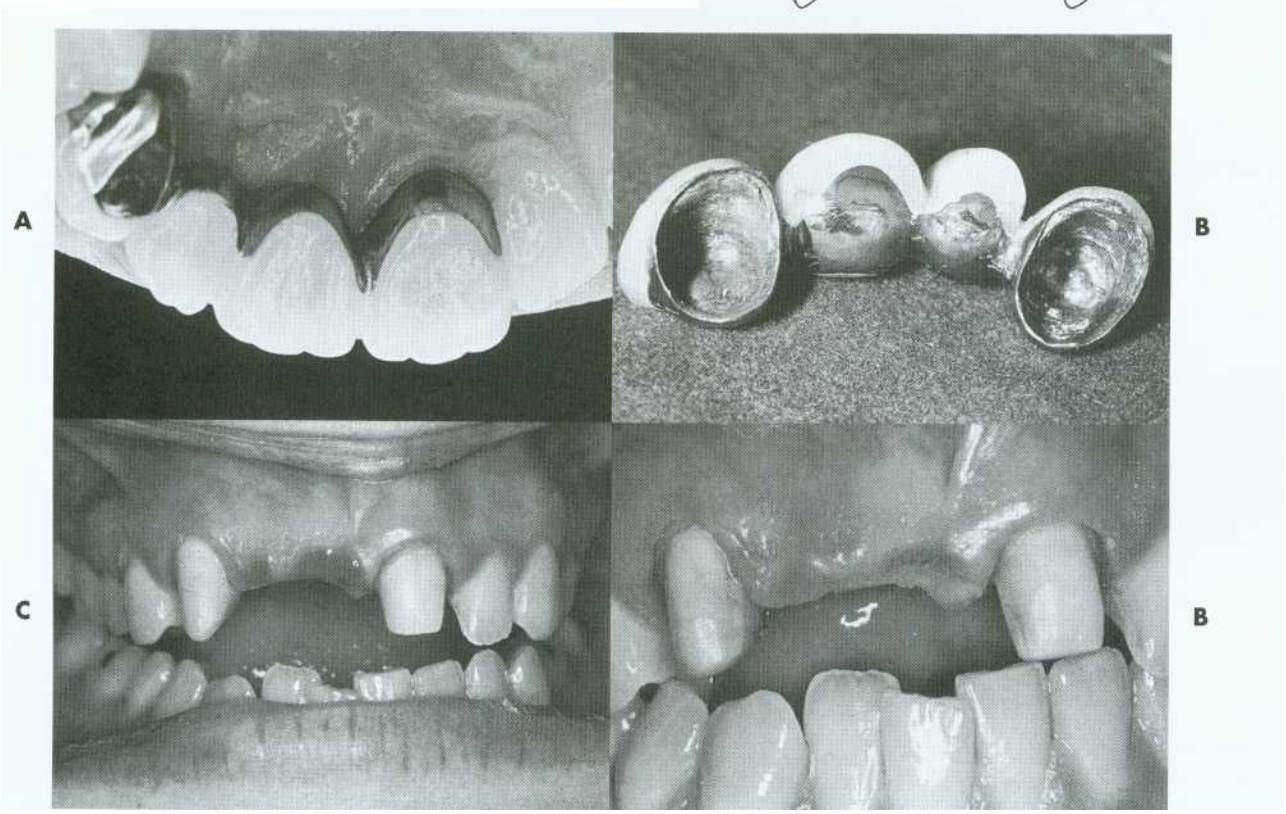


Fig. 20-13. A and B, FPD with a ridge-lap (concave) gingival surface. C, When it was removed, the tissue was found to be ulcerated. D, The defective FPD was recontoured and used as a provisional restoration while the definitive restoration was being fabricated. Within 2 weeks the ulceration had re-

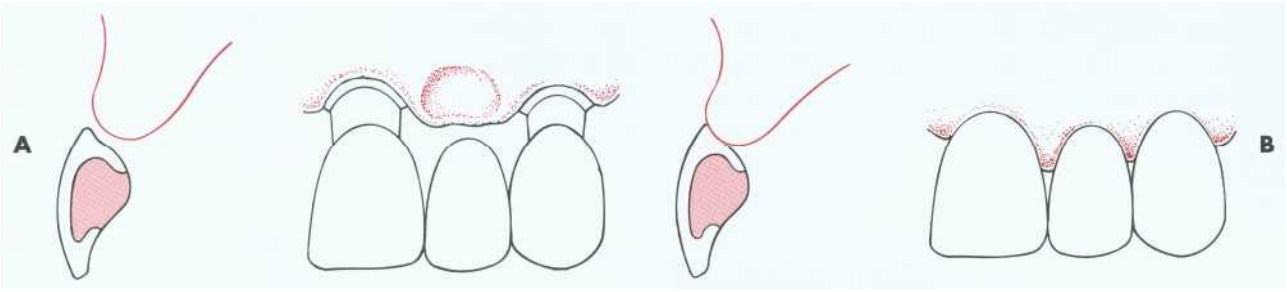


Fig. 20-14. Modified ridge lap pontic. A, FPD partially seated. B, FPD seated.

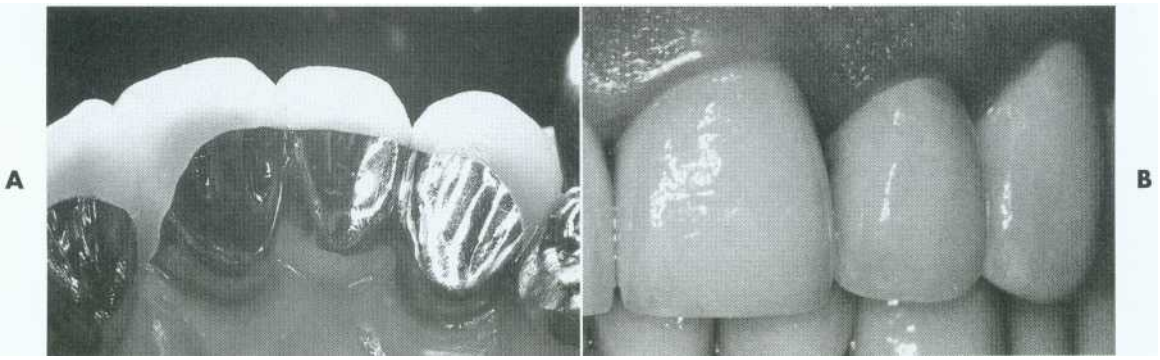


Fig. 20-15. Three-unit FPD replacing the maxillary lateral incisor. A, To facilitate plaque control, the lingual surface is made convex. B, The facial surface is shaped to simulate the missing tooth.

essential for a natural appearance. Although this design was historically referred to as *ridge-lap*,[8,9] the term *ridge-lap is* now used synonymously with the saddle design. The modified ridge lap design is the most common pontic form used in areas of the mouth that are visible during function (maxillary and mandibular anterior teeth and maxillary premolars and first molars).

CONICAL PONTIC

Often called *egg-shaped, bullet-shaped,* or *heart-shaped,* the **conical pontic** (Fig. 20-17) is easy for the patient to keep clean. It should be made as convex as possible, with only one point of contact at the center of the residual ridge. This design is recommended for the replacement of mandibular posterior teeth where esthetics is a lesser concern. The facial and lingual contours are dependent on the width of the residual ridge; a knife-edged residual ridge will necessitate flatter contours with a narrow tissue contact area. This type of design may be unsuitable for broad residual ridges, because the emergence profile associated with the small tissue contact point may create areas of food entrapment (Fig. 20-18). The sanitary or hygienic pontic is the design of choice in these clinical situations.

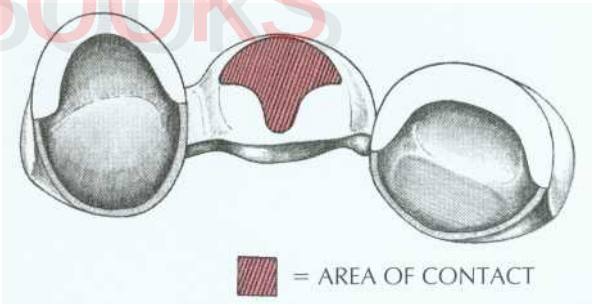


Fig. 20-16. Tissue contact of a maxillary FPD should resemble the letter T. This FPD is viewed from the gingival aspect.

OVATE PONTIC

The **ovate pontic is the most esthetically** appealing pontic design. Its convex tissue surface resides in a soft tissue . depression or hollow in the residual ridge, which makes it appear that a tooth is literally emerging from the gingiva (Fig. 20-19). Careful treatment planning is necessary for successful results. Socket-preservation techniques, which have already been described, should be performed at the time of extraction to create the tissue recess from which the ovate pontic form will emerge. For a preexisting residual ridge, soft tissue surgical

augmentation is typically required. When an adequate volume of ridge tissue is established, a socket depression is sculpted into the ridge with surgical diamonds or electrosurgery. In either case, meticulous attention to the contour of the pontic of the provisional restoration is essential when conditioning and shaping the residual ridge that will receive the definitive prosthesis.

The ovate pontic's advantages include its pleasing appearance and its strength. When used successfully with **ridge augmentation,** its emergence from the ridge appears identical to that of a natural

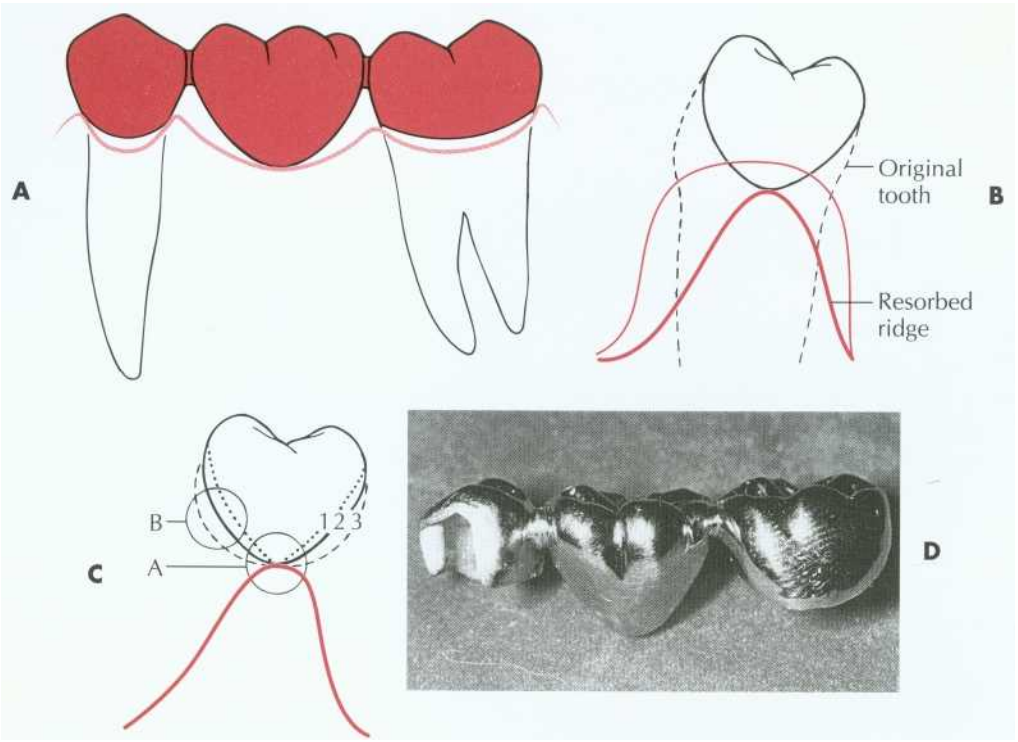


Fig. 20-17. A and B, A pontic with maximum convexity and single point contact of the tissue surface is the easiest design to keep clean. C, Evaluating the contour of three possible pontic shapes (1, 2, and 3). Contour 3 is the most convex in area *B* but is too flat in area A. Contour 1 is convex in area A but is too flat in area *B*. Contour 2 is the best. D, An all-metal FPD with a conical pontic, suitable for replacement of a mandibular molar.

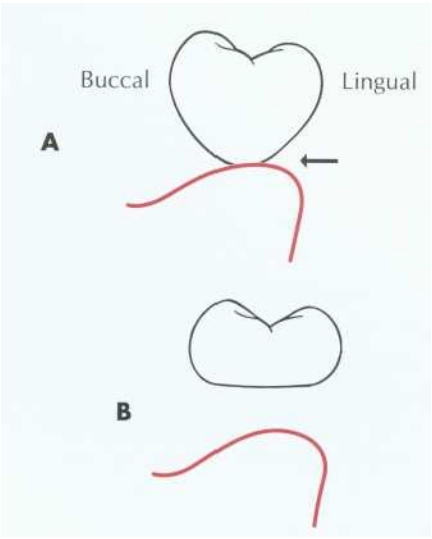


Fig. 20-18. A, Conical pontics may create food entrapment on broad residual ridges (arrow). B, The sanitary pontic form may be a better alternative.

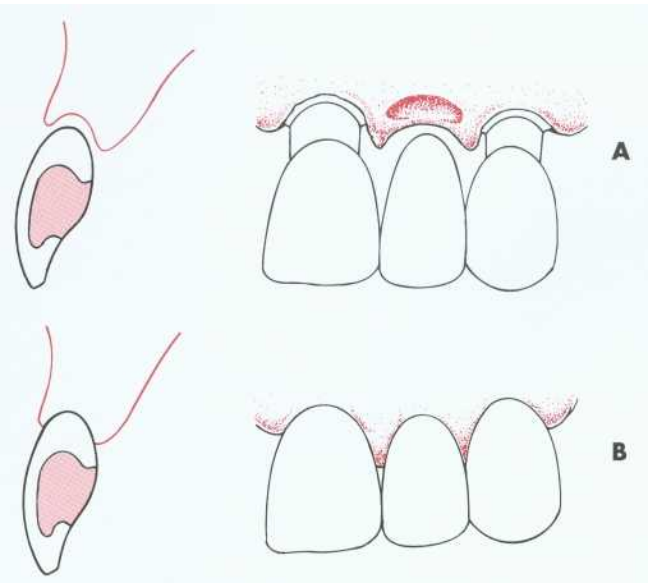


Fig. 20-19. Ovate pontic. A, FPD partially seated. B, FPD seated.

tooth. In addition, its recessed form is not susceptible to food impaction. The broad convex geometry is stronger than that of the modified ridge lap pontic, because the unsupported, thin porcelain that often exists at the gingivofacial extent of the pontic is eliminated (Fig. 20-20). Because the tissue surface of the pontic is convex in all dimensions, it is accessible to dental floss; however, meticulous oral hygiene is necessary to prevent tissue inflammation resulting from the large area of tissue contact. Other disadvantages include the need for surgical tissue management and the associated cost.

BIOLOGIC CONSIDERATIONS

The biologic principles of pontic design pertain to the maintenance and preservation of the residual ridge, abutment and opposing teeth, and supporting tissues. Factors of specific influence are pontic-ridge contact, amenability to oral hygiene, and the direction of occlusal forces.

RIDGE CONTACT

Pressure-free contact between the pontic and the underlying tissues is indicated to prevent ulceration and inflammation of the soft tissues.[1,20] If any blanching of the soft tissues is observed at try-in, the pressure area should be identified with a disclosing medium (i.e., pressure-indicating paste) and the pontic recontoured until tissue contact is entirely passive. This passive contact should occur exclusively on keratinized attached tissue. When a pontic rests on mucosa, some ulcerations may appear as a result of the normal movement of the mucosa in contact with the pontic (Fig. 20-21). Positive ridge pressure may be due to excessive scraping of the ridge area on the working cast (Fig. 20-22). This was once promoted as a way to improve the appearance of the pontic-ridge relationship. However, because of the ulceration that inevitably results when flossing is not meticulously performed, the concept is not recommended,[1,21,22] unless done as previously described as an ovate pontic.[23,20]

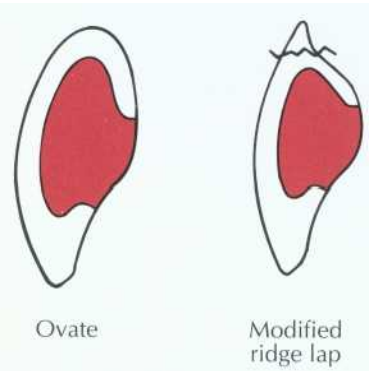


Fig. 20-20. The ovate pontic design eliminates the potential for unsupported porcelain in the cervical portion of an anterior pontic.

ORAL HYGIENE CONSIDERATIONS

The chief cause of ridge irritation is the toxins released from microbial plaque, which accumulate between the gingival surface of the pontic and the residual ridge, causing tissue inflammation and calculus formation.

Unlike removable partial dentures, FPDs cannot be taken out of the mouth for daily cleaning. Patients must be taught efficient oral hygiene techniques, with particular emphasis on cleaning the gingival surface of the pontic. The shape of the gingival surface, its relation to the ridge, and the materials used in its fabrication will influence ultimate success.

Normally, where tissue contact occurs, the gingival surface of a pontic is inaccessible to the bristles of a toothbrush. Therefore, excellent hygiene habits must be developed by the patient. Devices such as proxy brushes, pipe cleaners, SuperFloss,* and

*Oral-B Laboratories: Redwood City, Calif.

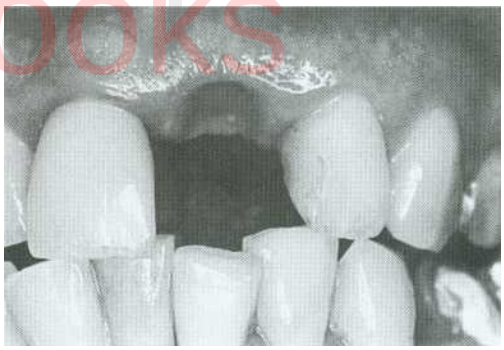


Fig. 20-21. Pressure will inevitably lead to ulceration.

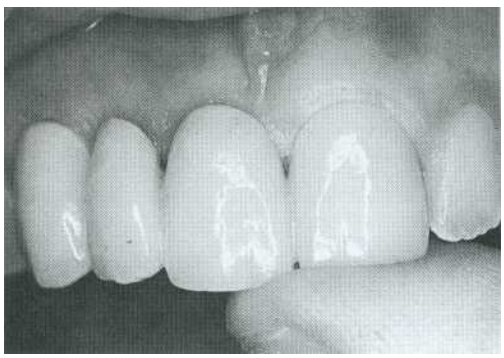


Fig. 20-22. Soft tissue blanching at try-in indicates pressure.

Fig. 20-23. The patient must be instructed how to clean the gingival surface of a pontic with floss.

dental floss with a threader are highly recommended (Fig. 20-23). Gingival embrasures around the pontic should be wide enough to permit oral hygiene aids. However, to prevent food entrapment, they should not be opened excessively. To permit passage of floss over its entire tissue surface, tissue contact between the residual ridge and pontic must be passive.

If the pontic has a depression or concavity in its gingival surface, plaque will accumulate, because the floss cannot clean this area, and tissue irritation[24] will follow. This is usually reversible; when the surface is subsequently modified to eliminate the concavity, inflammation disappears (see Fig. 20-13). Therefore, an accurate description of pontic design should be submitted to the laboratory, and the prosthesis should be checked and corrected if necessary before cementation. Prevention is the best solution for controlling tissue irritation.

PONTIC MATERIAL

Any material chosen to fabricate the pontic should provide good esthetic results where needed; biocompatibility, rigidity, and strength to withstand occlusal forces; and longevity. FPDs should be made as rigid as possible, because any flexure during mastication or parafunction may cause pressure on the gingiva and cause fractures of the veneering material. Occlusal contacts should not fall on the junction between metal and porcelain during centric or eccentric tooth contacts, nor should a metal-ceramic junction occur in contact with the residual ridge on the gingival surface of the pontic.

Investigations into the biocompatibility of materials used to fabricate pontics have centered on two factors: (1) the effect of the materials and (2) the effects of surface adherence. Glazed porcelain is generally considered the most biocompatible of the

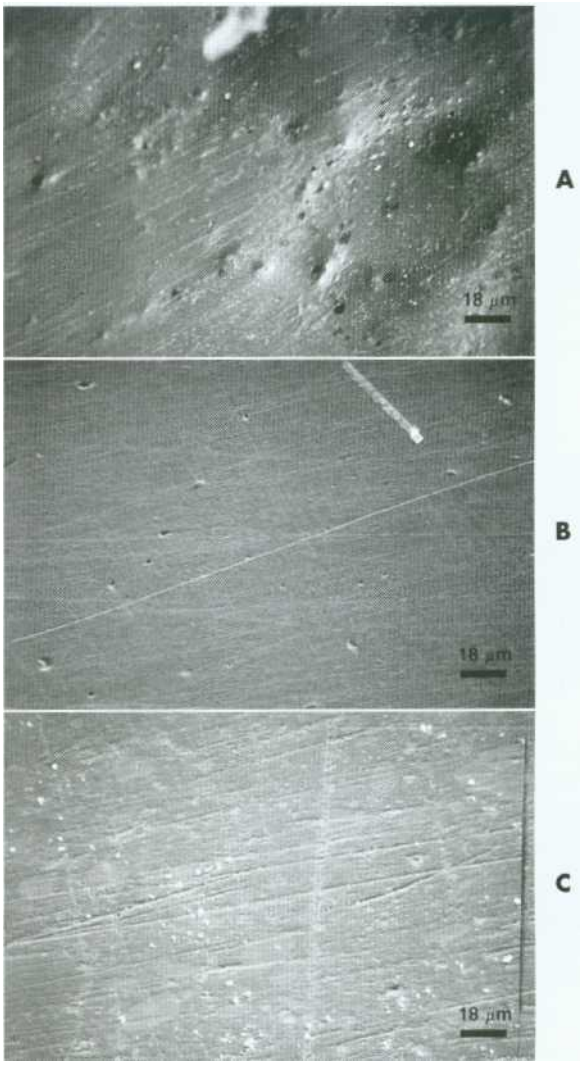


Fig. 20-24. Scanning electron micrographs of glazed porcelain (A), polished gold (B), and polished acrylic resin (C).
(Microscopy by Dr. J.L. Sandrik.)

available pontic materials, and clinical data[21,21] tend to support this opinion, although the critical factor seems to be the material's ability to resist plaque accumulation (rather than the material itself). Well-polished gold is smoother, less prone to corrosion, and less retentive of plaque than an unpolished or porous casting. However, even highly polished surfaces will accumulate plaque if oral hygiene measures are ignored .

Although glazed porcelain looks very smooth, when viewed under a microscope, its surface shows many voids and is rougher than either polished gold or acrylic resin[13] (Fig. 20-24). Nevertheless, highly glazed porcelain is easier to clean than other materials. For easier plaque removal and biocompatibility, the tissue surface of the pontic should be

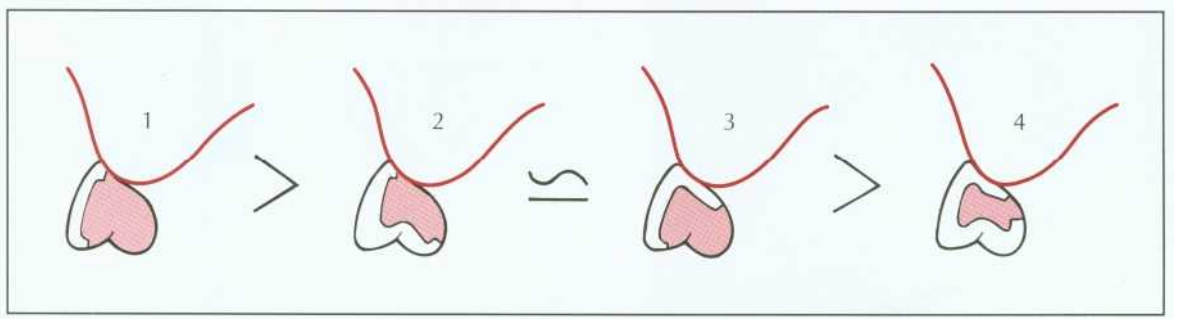


Fig. 20-25. Four pontic designs in descending order of strength based on cross sectional diameter of the metal substructure. When vertical space is minimal, design 4 (porcelain tissue and occlusal coverage) may be contraindicated.

made in glazed porcelain. However, ceramic tissue contact may be contraindicated in edentulous areas where there is **minimal distance between the residual ridge and the occlusal table. In these instances, placing ceramic on the tissue side of the pontic may weaken the design of the metal substructure, particularly with porcelain occlusal surface** (Fig. 20-25). If gold is placed in tissue contact, it should be highly polished. Regardless of the choice of pontic material, patients can prevent inflammation around the pontic with meticulous oral hygiene .[34]

OCCLUSAL FORCES

Reducing the buccolingual width of the pontic by as much as 30% has been suggested as a way to lessen occlusal forces on, and thus the loading of, abutment teeth. **This practice continues today, although it has little scientific basis.** Critical analysis reveals that forces are lessened only when chewing food of uniform consistency and that a mere 12% increase **in chewing efficiency can be expected from a one-third reduction of pontic width. Potentially harmful forces are more likely to be encountered if an FPD is loaded by the accidental** biting **on a hard object or by parafunctional activities like bruxism rather than by chewing foods of uniform consistency.** These **forces are not reduced by narrowing the occlusal table.**

In fact, narrowing the occlusal table may actually impede or even preclude the development of a harmonious and stable occlusal relationship. **Like a malposed tooth, it may cause difficulties in plaque control and may not provide** proper cheek support. For these **reasons, pontics with normal occlusal widths (at least on the occlusal third) are generally recommended.** One exception is if the residual alveolar ridge has collapsed buccolingually. Reducing pontic width may then be desired, thereby lessening the lingual contour and facilitating plaque-control measures.

Fig. 20-26. Failure of a long span metal-ceramic FPD subjected to high stress.

MECHANICAL CONSIDERATIONS

The prognosis of fixed partial denture pontics will be compromised if mechanical principles are not followed closely. **Mechanical problems may be caused by improper choice of materials, poor framework design, poor tooth preparation, or poor occlusion.** These factors can lead to fracture of the prosthesis or displacement of the retainers. Long-span posterior FPDs are particularly susceptible to mechanical problems. Inevitably, there is significant flexing from high occlusal forces and because the displacement effects increase with the cube of the span length (see p. 71). Therefore, evaluating the likely forces on a pontic and designing accordingly are important. For example, a strong all-metal pontic may be needed in high-stress situations rather than a metal-ceramic pontic (Fig. 20-26), which would be more susceptible to fracture. When metal-ceramic pontics are chosen, extending porcelain onto the occlusal surfaces to achieve better esthetics should also be carefully evaluated. **In addition to its potential for fracture, porcelain may abrade the opposing dentition if the occlusal contacts are on enamel or metal.**

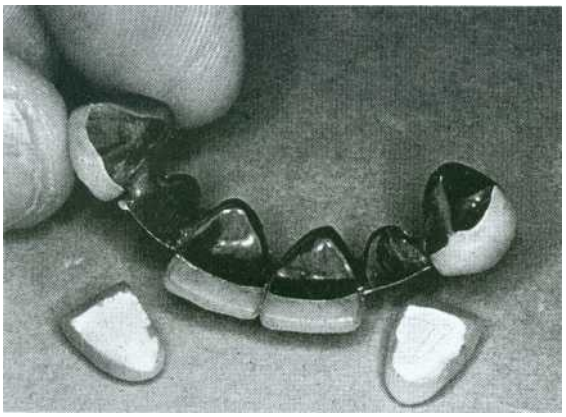


Fig. 20-27. Failure resulting from improper laboratory technique.

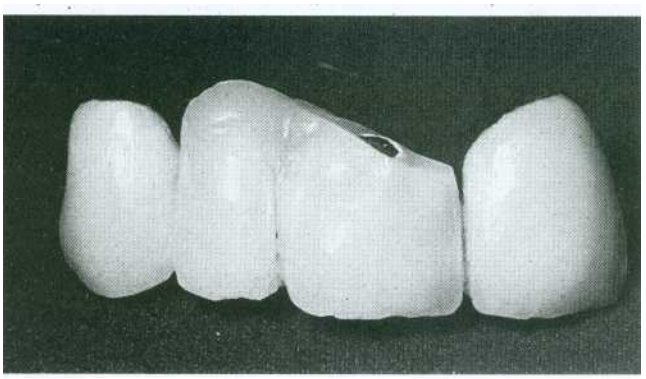


Fig. 20-28. Failure of unsupported gingival porcelain.

AVAILABLE PONTIC MATERIALS

Some fixed partial dentures are fabricated entirely of metal, porcelain, or acrylic resin, but most use a combination of metal and porcelain. Acrylic resin-veneered pontics have had limited acceptance because of their reduced durability (wear and discoloration). The newer indirect composites, based on high inorganic-filled resins and the fiber-reinforced materials (see Chapter 27), have revived interest in composite resin and resin-veneered pontics.

Metal-ceramic Pontics. Most pontics are fabricated by the metal-ceramic technique. If properly used, this technique is helpful for solving commonly encountered clinical problems. A well-fabricated metal-ceramic pontic is strong, easy to keep clean, and looks natural. However, mechanical failure (Fig. 20-27) can occur and often is attributable to inadequate framework design. The principles of framework design are discussed in Chapter 19, but the following points will be emphasized in this chapter:

1. The framework must provide a uniform veneer of porcelain (approximately 1.2 mm). Excessive thickness of porcelain contributes to inadequate support and predisposes to eventual fracture (Fig. 20-28). This is often true in the cervical portion of an anterior pontic. A reliable technique for ensuring uniform thickness of porcelain is to wax the fixed prosthesis to complete anatomic contour and then accurately cut back the wax to a predetermined depth (Fig. 20-29).
2. The metal surfaces to be veneered must be smooth and free of pits. Surface irregularities will cause incomplete wetting by the porcelain slurry, leading to voids at the porcelain-metal interface that reduce bond strength and increase the possibility of mechanical failure.
3. Sharp angles on the veneering area should be rounded. They produce increased stress concentrations that can cause mechanical failure.
4. The location and design of the external metal-porcelain junction require particular attention. Any deformation of the metal framework at the junction can lead to chipping of the porcelain (Fig. 20-30). For this reason, occlusal centric contacts must be placed at least 1.5 mm away from the junction. Excursive eccentric contacts that might deform the metal-ceramic interface must be watched carefully.

Resin-veneered Pontics. Historically, acrylic resin-veneered restorations had deficiencies that made them acceptable only as longer-term provisionals. Their resistance to abrasion was lower than enamel or porcelain, and noticeable wear occurred with normal toothbrushing (Fig. 20-31). Furthermore, the relatively high surface area/volume ratio of a thin resin veneer made dimensional change from water absorption and thermal fluctuations (thermocycling) a problem. Because no chemical bond existed between the resin and the metal framework, the resin was retained by mechanical means (e.g., undercuts). Continuous dimensional change of the veneers often caused leakage at the metal-resin interface, with subsequent discoloration of the restoration.

Nevertheless, there are certain advantages to using polymeric materials instead of ceramics: they are easy to manipulate and repair and do not require the high-melting range alloys needed for metal-ceramic techniques. Recently introduced indirect composite resin systems have resolved some

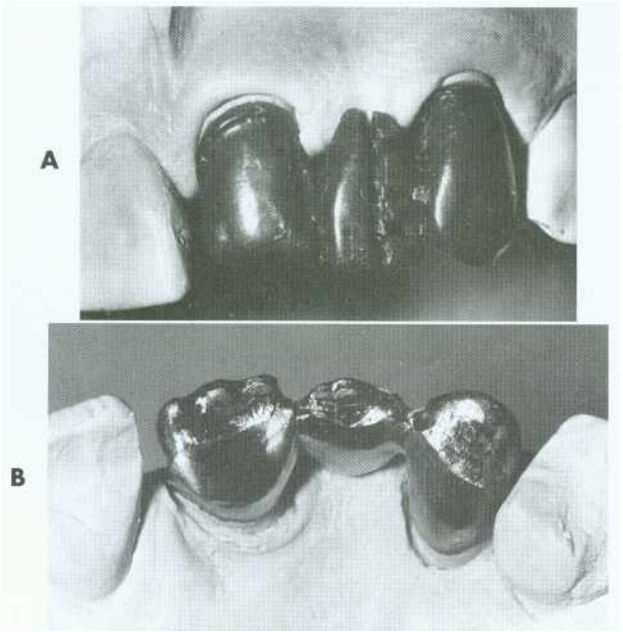


Fig. 20-29. A, Waxing to anatomic contour and controlled cut-back are the most reliable approaches to fabricating a satisfactory metal substructure (B).

Fig. 20-30. Failure caused by occlusal contact across the metal-ceramic junction.

of the problems inherent in previous indirect resin veneers. These new-generation indirect resins have a higher density of inorganic ceramic filler than traditional direct and indirect composite resins. Most use a post-curing process that results in high flexural strength, minimal polymerization shrinkage, and wear rates comparable to those of tooth enamel.[38] In addition, improvements in the bond between the composite resin and metal[39] may lead to a reappraisal of resin veneers.

Fiber-reinforced Composite Resin Pontics. Composite resins can be used in fixed partial dentures without a metal substructure (see Chapter 27). A substructure matrix of impregnated glass or polymer fiber provides structural strength. The physical properties of this system, combined with its excellent marginal adaptation and esthetics, make it a possible metal-free alternative for FPDs, although long-term clinical performance is not yet known.

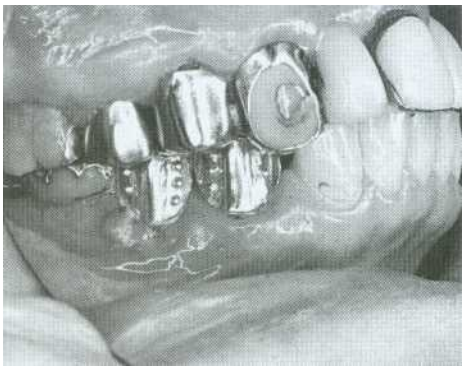


Fig. 20-31. Wear of an acrylic resin-veneered prosthesis.

ESTHETIC CONSIDERATIONS

No matter how well biologic and mechanical principles have been followed during fabrication, the patient will evaluate the result by how it looks, especially when anterior teeth have been replaced. Many esthetic considerations that pertain to single crowns also apply to the pontic (see Chapter 23). Several problems unique to the pontic may be encountered when attempting to achieve a natural appearance.

THE GINGIVAL INTERFACE

An esthetically successful pontic will replicate the form, contours, incisal edge, gingival and incisal embrasures, and color of adjacent teeth. The pontic's simulation of a natural tooth is most often betrayed at the tissue-pontic interface. The greatest challenge here is to compensate for anatomic changes that occur after extraction. Special attention should be paid to the contour of the labial surface as it approaches the pontic-tissue junction to achieve a "natural" appearance. This cannot be accomplished by merely duplicating the facial contour of the missing tooth, because after a tooth is removed, the alveolar bone undergoes resorption and/or remodeling. If the original tooth contour were followed, the pontic would look unnaturally long incisogingivally (Fig. 20-32). To achieve the illusion of a natural tooth, an esthetic pontic must deceive observers into believing they are seeing a natural tooth.

The modified ridge-lap pontic is recommended for most anterior situations; it compensates for lost buccolingual width in the residual ridge by overlapping what remains. Rather than emerging from the crest of the ridge as a **natural tooth would,** the cervical aspect of **the pontic sits in front of the ridge, covering any abnormal ridge morphology resulting from tooth loss. Fortunately, because most teeth are** viewed from only two dimensions, this relationship remains undetected. A properly designed, modified ridge-lap provides the required convexity on the tissue side, with smooth and open embrasures on the lingual side for ease of cleaning. This is difficult to accomplish. Clinically, many pontics are seen with less than optimal contour, resulting in an unnatural appearance. This can be avoided with careful preparation at the diagnostic waxing stage (see Chapter 3). Sometimes the ridge tissue must be surgically reshaped to enhance the result.

In normal situations, light falls from above, and an object's shadow is below it. Unexpected lighting or unexpectedly placed shadows (Fig. 20-33) can be confusing to the brain. **Because of past experience, the brain "knows" that a tooth grows out of the gingiva, and it therefore** "sees" a pontic as a tooth unless telltale shadows suggest otherwise. **Special care must be taken when studying where shadows fall around natural teeth, particularly around the gingival margin.** If a pontic **is poorly adapted to the residual ridge, there will be an unnatural shadow in the cervical area that looks odd and spoils the illu-**

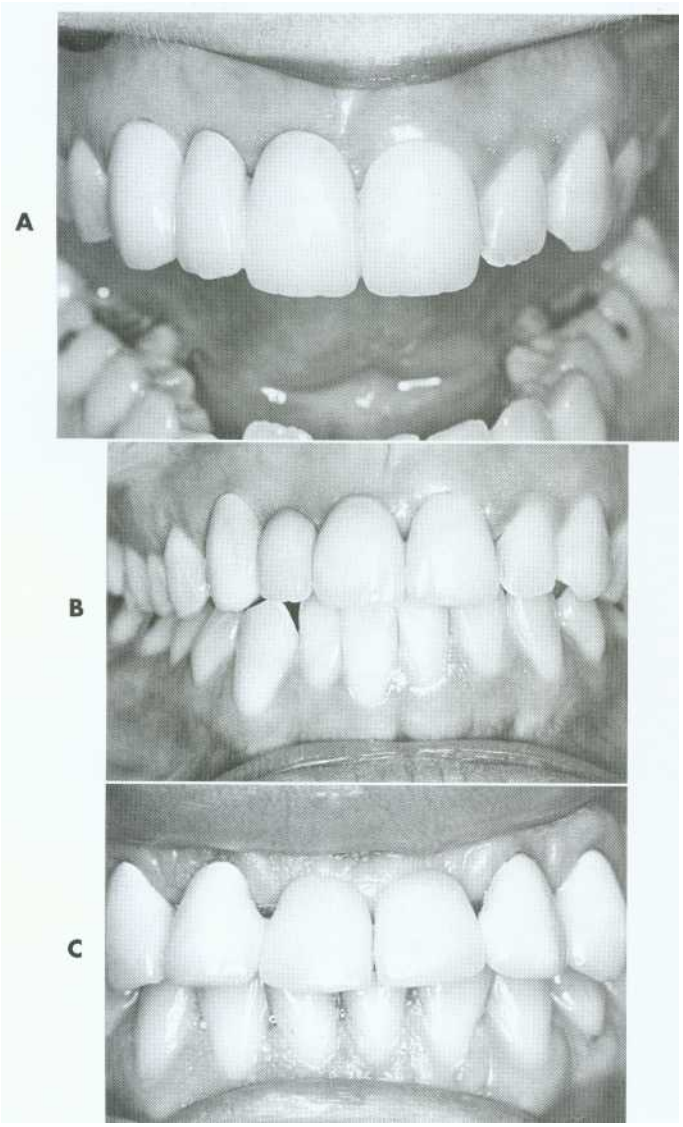


Fig. 20-32. Correct incisogingival height is critical to esthetic pontic design. A, Esthetic failure of a four-unit FPD replacing the right central and lateral incisors. The pontics have been shaped to follow the facial contour of the missing teeth, but because of bone loss they look too long. B, The replacement FPD. Note that the gingival half of each pontic has been reduced. Esthetics is much improved. C, This esthetic failure is the result of excessive reduction. The central incisor pontics look too short.

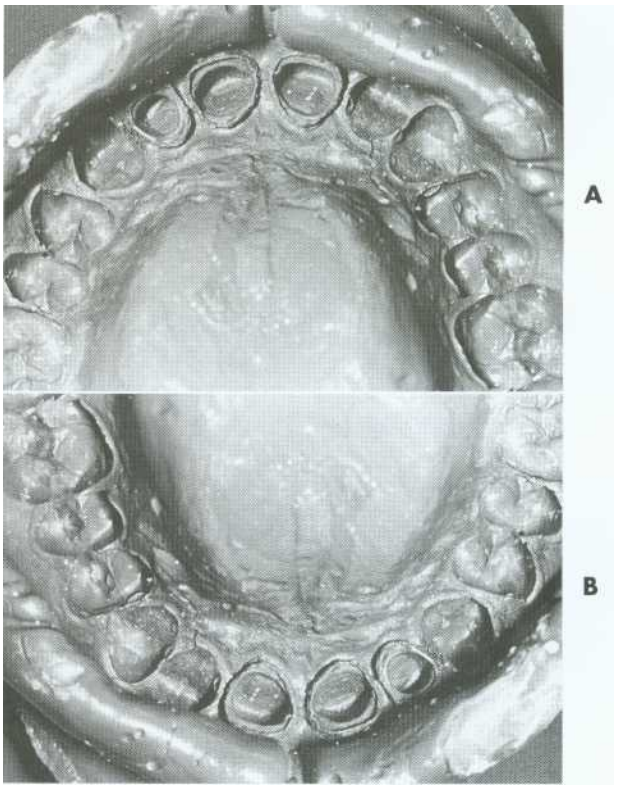


Fig. 20-33. Optical illusion. A and B are identical except that one image is upside down. Most people make different three-dimensional interpretations of each photograph, interpreting one as a negative impression and the other as a positive cast. (Verify the illusion by turning the book.) The interpretation is based on how shadows fall; in normal situations, objects are seen illuminated from above.

sion of a natural tooth (Fig. 20-34). In additional, recesses occurring at the gingival interface will collect food debris, further betraying the illusion of a naturaltooth.

When appearance is of utmost concern, the ovate pontic, used in conjunction with alveolar preservation or soft tissue ridge augmentation, can provide an appearance at the gingival interface that is virtually indistinguishable from a natural tooth. Because it emerges from a soft tissue recess, this pontic is not susceptible to many of the esthetic pitfalls previously described for the modified ridge lap pontic. However, in most cases, the patient must be willing to undergo the additional surgical procedures that an ovate pontic requires.

INCISOGINGIVAL LENGTH

Obtaining a correctly sized pontic simply by duplicating the original tooth is not possible. Ridge resorption will make such a tooth look too long in the cervical region. The height of a tooth is immediately obvious when the patient smiles and shows the gingival margin (Fig. 20-35). An abnormal labiolingual position or cervical contour, however, is not immediately obvious. This fact can be used to produce a pontic of good appearance by recontouring the gingival half of the labial surface (see Fig. 20-35). The observer sees a normal tooth length but is unaware of the abnormal labial contour. The illusion is successful.

Even with moderately severe bone resorption, obtaining a natural appearance by exaggerated contouring of the pontics may still be possible. In areas where tooth loss is accompanied by excessive loss of alveolar bone, however, a pontic of normal length would not touch the ridge at all.

One solution is to shape the pontic to simulate a normal crown and root with emphasis on the cementoenamel junction. The root can be stained to simulate exposed dentin (Fig. 20-36). Another approach is to use pink porcelain to simulate the gingival tissues (Fig. 20-37). However, such pontics then have considerably increased tissue contact and require scrupulous plaque control for long-term

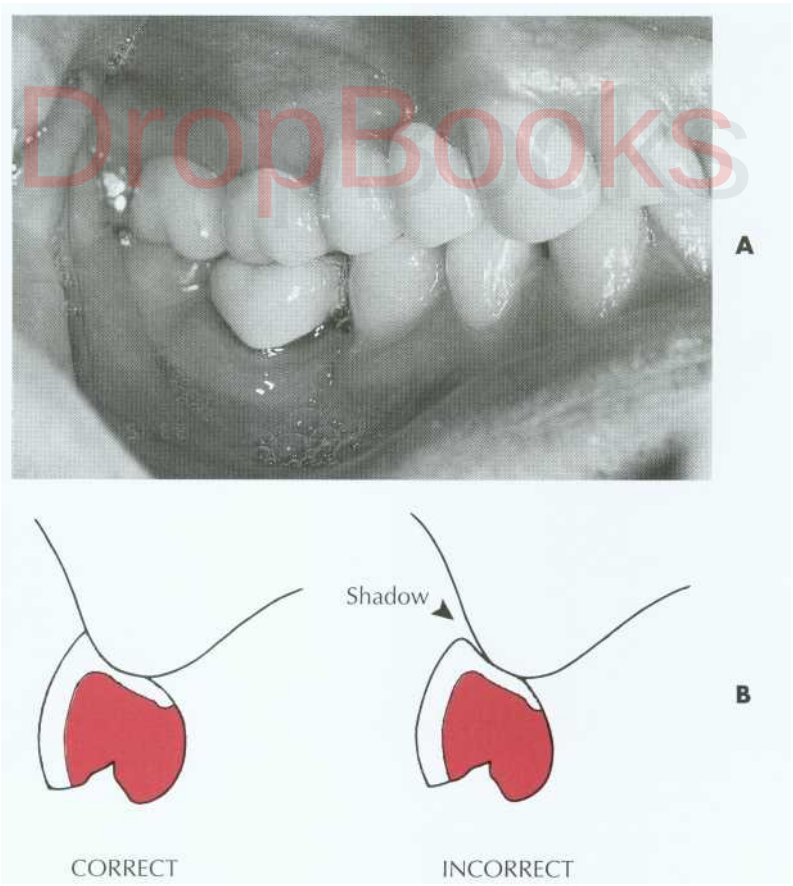
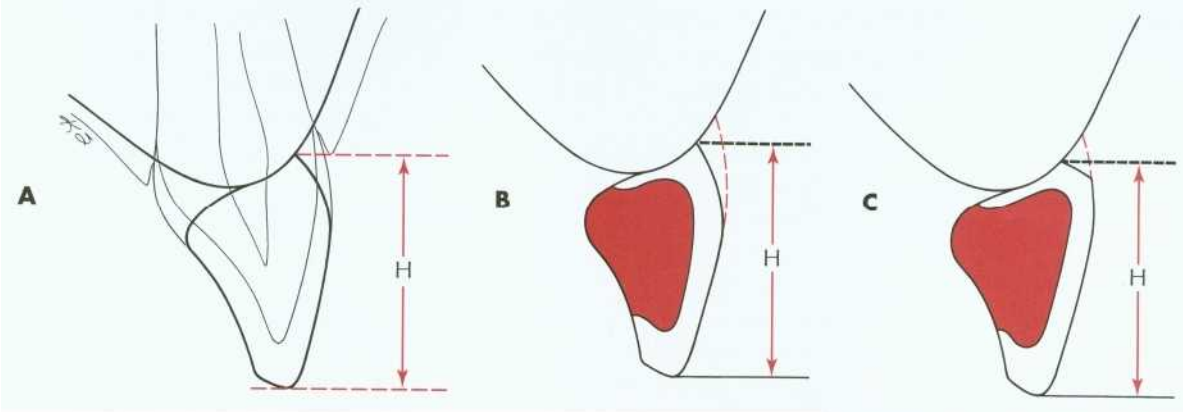


Fig. 20-34. A pontic should be interpreted as "growing" out of the gingival tissue. The second premolar pontic in the four-unit FPD (A) is successful because it is well adapted to the ridge; however, the pontic for the first premolar is evident because of its poor adaptation to the ridge, which creates a shadow. B, Shadows around the gingival surface (arrow) spoil the esthetic illusion.



It is often necessary to recontour a substantial portion of the facial surface (**B**) to minimize a shadow or food trap at the cervical of the pontic (**C**).

Fig. 20-35. A, A pontic should have the same incisogingival height (H) as the original tooth. B, Correctly contoured pontic. C, Incorrect contour. (The dotted lines in B and C show the original tooth contour.) The shelf at the gingival margin may trap food and create an esthetically unacceptable shadow.

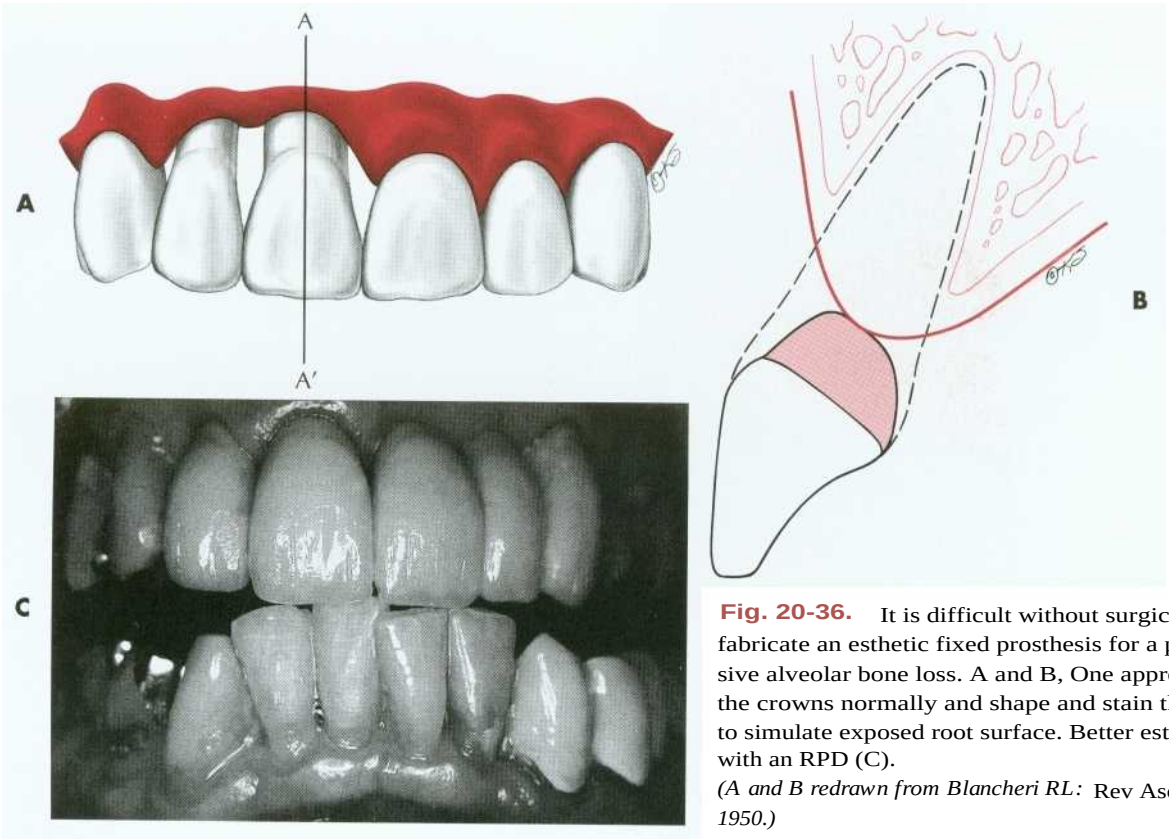


Fig. 20-36. It is difficult without surgical augmentation to fabricate an esthetic fixed prosthesis for a patient with extensive alveolar bone loss. A and B, One approach is to contour the crowns normally and shape and stain the apical extension to simulate exposed root surface. Better esthetics is obtainable with an RPD (C).
(A and B redrawn from Blancheri RL: Rev Asoc Dent Mex 8:103, *1950.)*

success. Ridge-augmentation procedures have been successful in correcting areas of limited resorption. When bone loss is severe, the esthetic result obtained with an RPD is often better than with an FPD.

MESIODISTAL WIDTH

Frequently, the space available for a pontic will be greater or smaller than the width of the contralateral tooth. This is usually due to uncontrolled tooth movement that occurred when a tooth was removed and not replaced.

Fig. 20-37. Fixed partial denture replacing maxillary left central and lateral incisors. This patient had lost significant bone from the edentulous ridge. Appearance of the prosthesis was enhanced with the use of pink porcelain between the pontics to simulate gingival tissue. The patient has been able to maintain excellent tissue health through the daily use of SuperFloss.

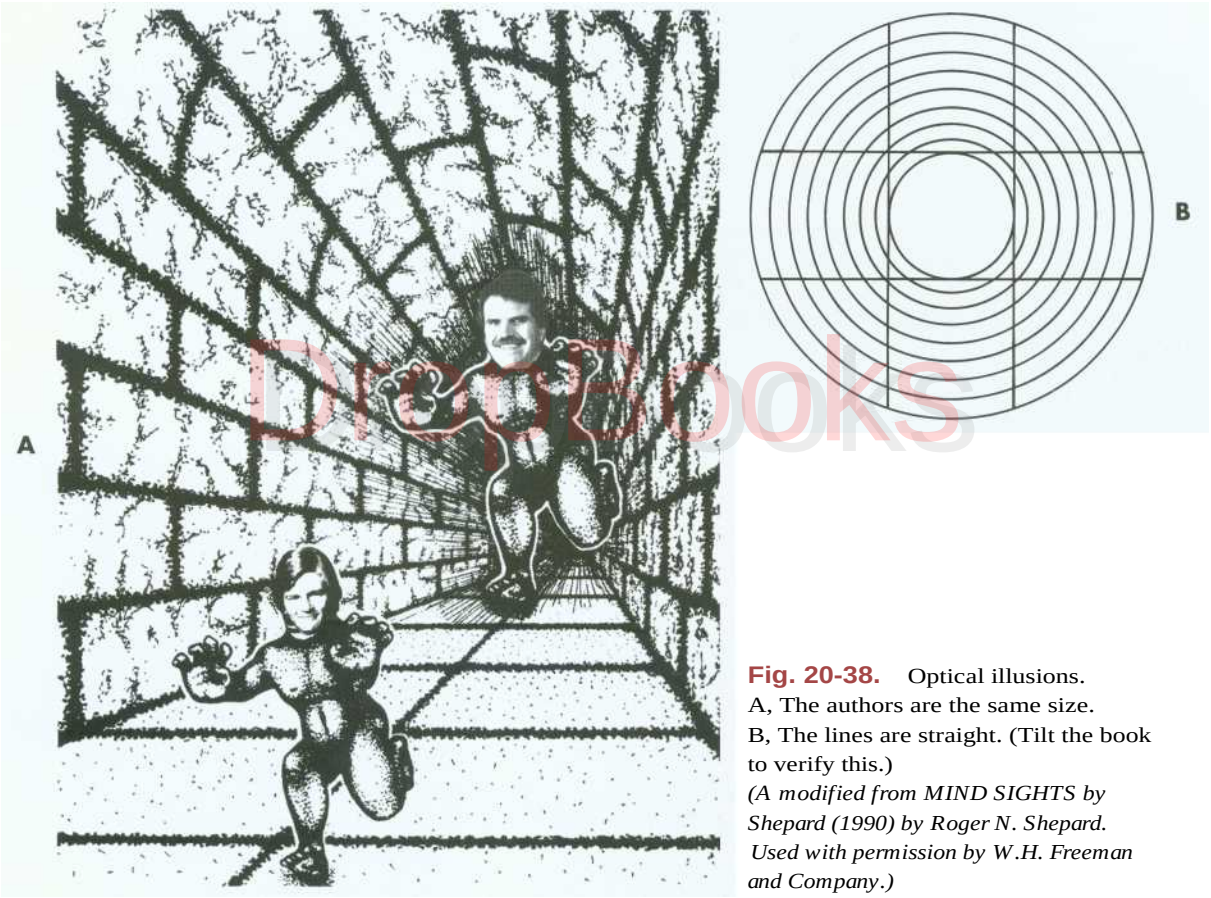


Fig. 20-38. Optical illusions.
A, The authors are the same size.
B, The lines are straight. (Tilt the book to verify this.)
(A modified from MIND SIGHTS by Shepard (1990) by Roger N. Shepard. Used with permission by W.H. Freeman and Company.)

If possible, such a discrepancy should be corrected by orthodontic treatment. If this is not possible, an acceptable appearance may be obtained by **incorporating visual perception principles into the pontic design.** In the same way that the brain can be confused into misinterpreting the relative sizes of shapes or lines because **of an erroneous interpretation of perspective** (Fig. 20-38), a pontic of abnormal size may be designed to give the illusion of **being a more natural size. The width of an anterior tooth is usually identified by the relative positions of the mesiofacial and distofacial line angles, and the overall shape by the detailed pattern** of **surface contour and light reflection between these line** angles. The **features of the contralateral tooth (Fig. 20-39) should be duplicated as precisely as possible in the pontic, and the space discrepancy can be compensated by altering the shape of the proximal areas.**

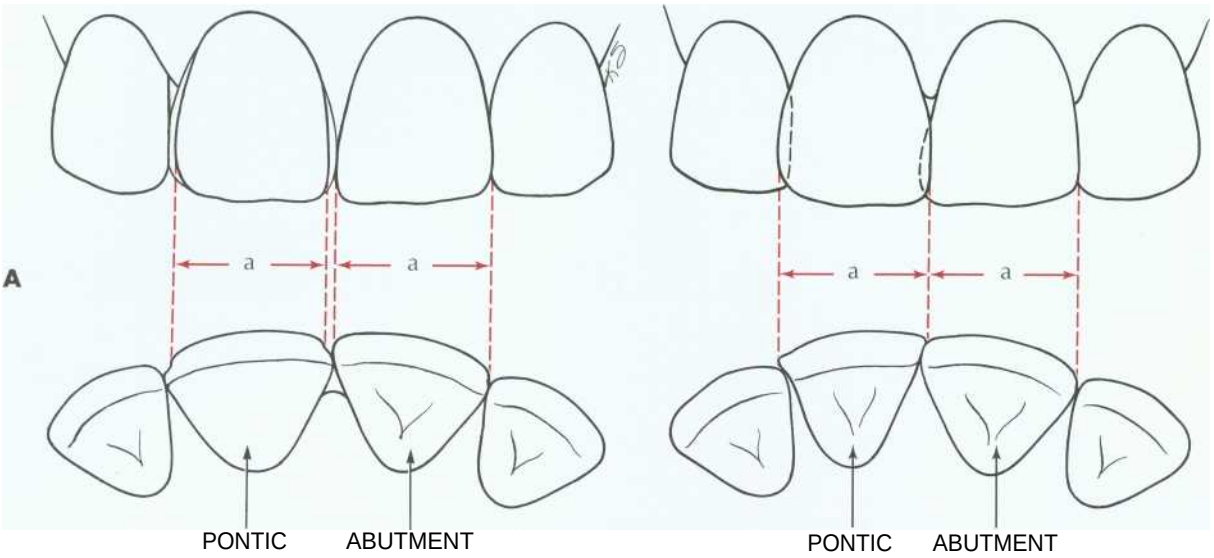


Fig. 20-39. An abnormally sized anterior pontic space can be restored esthetically by matching the location of the line angles and adjusting the interproximal areas. Large (A) and small (B) pontic spaces. Dimension *a* should be matched in the replacement.
(Redrawn from Blancheri RL: Rev Asoc Dent Mex 8:103, 1950.)

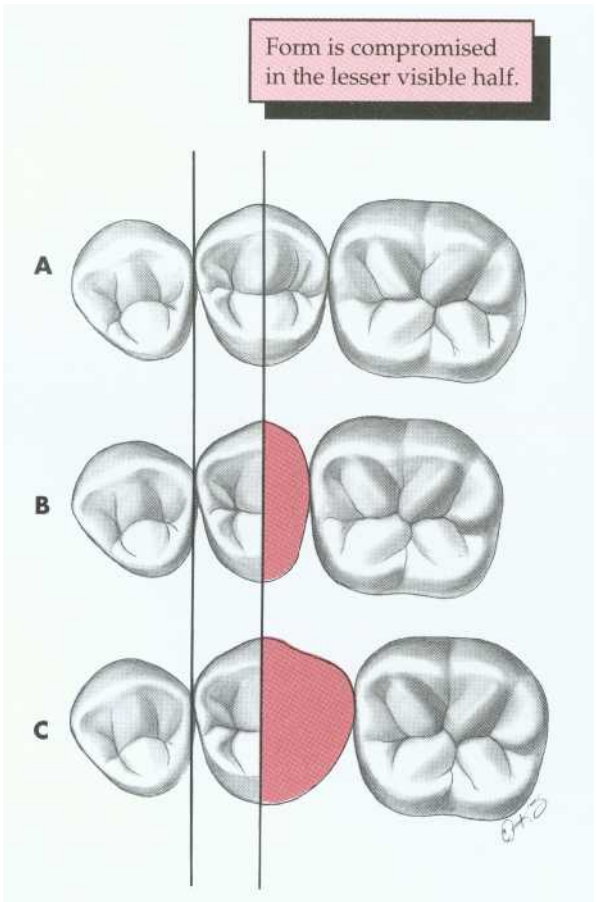


Fig. 20-40. When replacing a posterior tooth (A), duplicate the dimension of the more visible mesial half of the adjacent tooth. Narrow (B) and wide (C) pontic spaces.
(Redrawn from Blancheri RL: Rev Asoc Dent Mex 8:103, 1950.)

The retainers and the pontics can be proportioned to minimize the discrepancy. (This is another situation in which a diagnostic waxing procedure will help solve a **challenging restorative problem.)**

Space discrepancy presents less of a problem when posterior teeth are being replaced (Fig. 20-40) because their distal halves are not normally visible from the front. A **discrepancy here can be managed by duplicating the** visible **mesial half of the tooth and adjusting the size of the distal half.**

PONTIC FABRICATION

AVAILABLE MATERIALS

Over time, several techniques for pontic fabrication evolved. Prefabricated porcelain facings were very popular for use with conventional gold alloys. As use of the metal-ceramic technique increased **during the 1970s, prefabricated facings lost their popularity** and **essentially disappeared.** Al**though an acceptable substitute, custom-made metal-ceramic facings** never **gained widespread acceptance. Table 20-2 summarizes the various** techniques (Fig. 20-41).

Most pontics are now made with the metal-ceramic technique, which provides the best solution to the biologic, mechanical, and esthetic challenges encountered in pontic design. **Their fabrication, however, differs slightly from the fabrication of individual crowns. These differences will be emphasized in the ensuing paragraphs.**

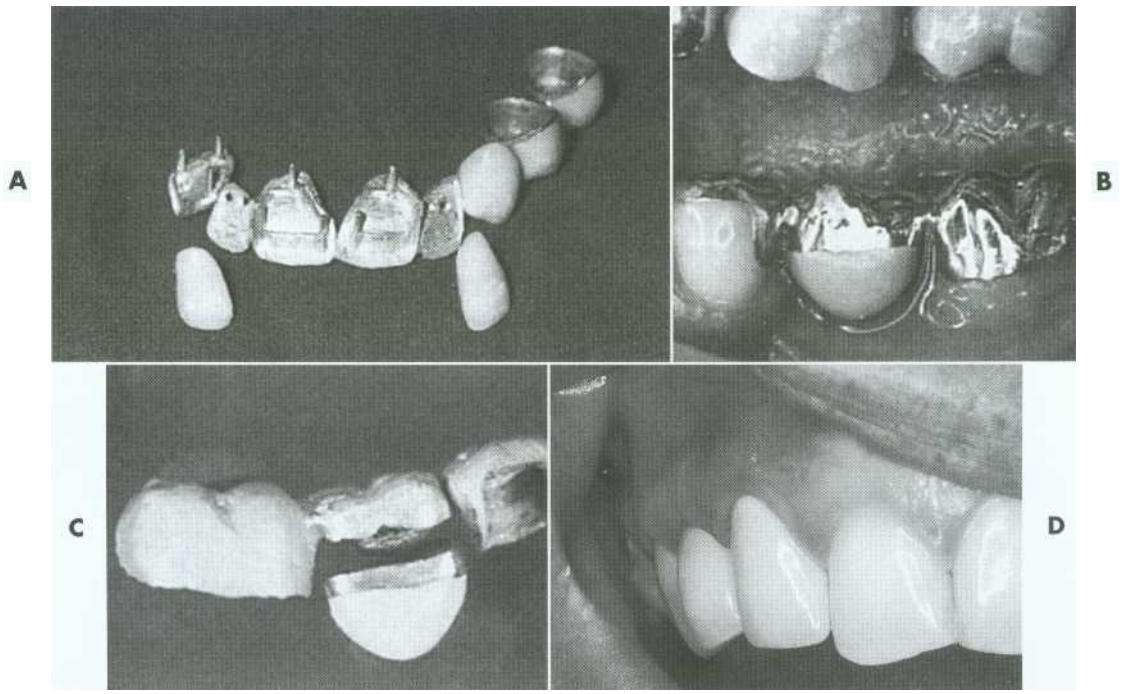


Fig. 20-41. A, Eight-unit FPD with porcelain facings. B and C, This three-unit posterior FPD has been fabricated by postceramic soldering of a metal-ceramic facing to conventional gold. D, Metal-ceramic FPD with a modified ridge lap pontic (canine) appears to emerge from the gingiva.

Available Pontic Systems TABLE 20-2

	Advantages	Disadvantages	Indications	Contraindications
Metal-ceramic	Esthetics Biocompatible	Difficult if an abutment is not metal-ceramic Weaker than all-metal	Most situations	Long spans with high stress
All-metal	Strength Straightforward procedure	Nonesthetic	Mandibular molars, especially under high stress	Where esthetics is important
Fiber-reinforced all-resin	Conservative when used with inlay preparations Esthetics Ease of repair	Long-term success unknown Limited to short spans	Areas of high esthetic concern	Long-span FPDs
Facings	Rarely used—of historical interest only			

METAL-CERAMIC PONTICS

A well-designed metal-ceramic pontic provides easy plaque removal, strength, wear resistance, and esthetics (see Fig. 20-41, D). Its fabrication is relatively simple if at least one retainer is also metal-ceramic. The metal framework for the pontic and one or both of its retainers is cast in one piece. This facilitates pontic manipulation during the successive laboratory and clinical phases. In the discussion that follows, it will be assumed that either or both of the retainers are metal-ceramic complete crowns. When this is not the case, an alternate approach is recommended.

Anatomic Contour Waxing. For strength and esthetics, an accurately controlled thickness of porcelain is needed in the finished restoration. To ensure this, a wax pattern is made to the final

anatomic contour. This also permits an assessment of connector design adequacy and the relationship between the connectors and the proposed configuration of the ceramic veneer (see Chapter 28).

Armamentarium (Fig. 20-42)

- Bunsen burner
- Inlay wax
- Sticky wax
- Waxing instruments
- Cotton cleaning cloth
- Die-wax separating liquid
- Zinc stearate or powdered wax
- Double-ended brushes
- Cotton balls
- Fine-mesh nylon hose

Step-by-step Procedure

1. Wax the internal, proximal, and axial surfaces of the retainers as described in Chapter 18.
2. Soften the inlay wax, mold it to the approximate desired pontic shape, and adapt it to the ridge. This is the starting point for subsequent modification. Alternatively (and perhaps preferably), an impression may be made of the diagnostic waxing or provisional restoration. Molten wax can then be poured into this to form the initial pontic shape. Prefabricated pontic shapes are also available as a starting point (Fig. 20-43).
3. If a posterior tooth is being replaced, leave the occlusal surface flat because the occlusion is best developed with the wax addition technique outlined in Chapter 18.
4. Lute the pontic to the retainers and, for additional stability, connect its cervical aspect directly to the master cast with sticky wax. Then wax the pontic to proper axial and occlusal (or incisal) contour (Fig. 20-44).
5. Complete the retainers and contour the proximal and tissue surfaces of the pontic for the desired tissue contact. The pontic is now ready for evaluation before cut-back.

Evaluation (Fig. 20-45). The form of the wax pattern is evaluated and any deficiencies are corrected. Particular attention is given to the connectors,

Fig. 20-42. Waxing armamentarium.

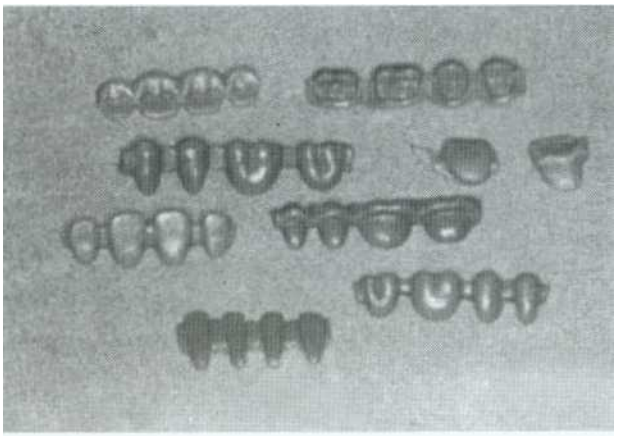


Fig. 20-43. Prefabricated wax pontics.

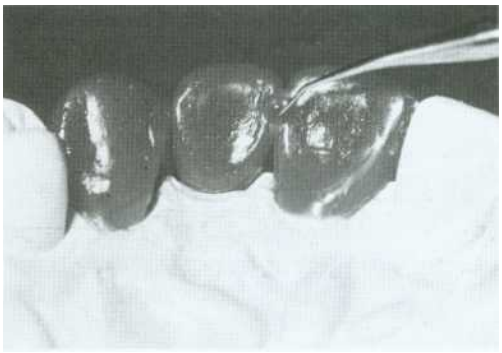


Fig. 20-44. Luting the pontic to the retainers.

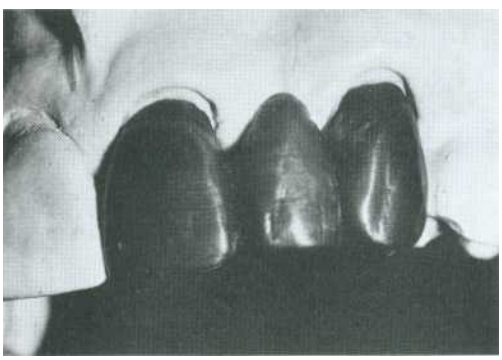


Fig. 20-45. Complete contour wax patterns.

which should have the correct shape and size. The connectors provide firm attachment for the pontic so it does not separate from the retainers during the subsequent cut-back procedure.

Cut-back

Armamentarium

- Bunsen burner
- Waxing instruments
- Cut-back instrument
- Scalpel
- Thin ribbon saw blade or sewing thread
- Explorer

Step-by-step Procedure

1. Use a sharp explorer to outline the area that will be veneered with porcelain (Fig. 20-46, A). The porcelain-metal junction must be placed sufficiently lingual to ensure good esthetics.
2. Make depth cuts or grooves in the wax pattern (see Chapter 19 and Fig. 20-46, B).
3. Complete the cut-back as far as access will allow with the units connected and on the master cast.
4. Section one wax connector with a thin ribbon saw (sewing thread is a suitable alternative) and remove the isolated retainer from the master cast (Fig. 20-46, C).
5. Finish the cut-back of this retainer, making sure there is a distinct 90-degree porcelain-metal junction.
6. Reflow and finalize the margins. The pontic is held in position by the other retainer during this procedure.
7. Refine the pontic cut-back where access is improved by removal of the first retainer.
8. Reseat the first retainer, reattach it to the pontic, section the other connector, and repeat the process.
9. Sprue the units and do any final reshaping as needed.
10. Invest and cast in the manner described in Chapter 22.

NOTE: When one connector of a three-unit FPD is to be cast and the other soldered, the cast connector should be sectioned first when the foregoing procedure is followed. The gingival surface of the pontic should be cut back in the metal rather than in the wax, because the tissue contact will help stabilize the pontic. Access is difficult, and it is easy to break the fragile wax connector.

Metal Preparation

Armamentarium

- Separating disk
- Ceramic-bound finishing stones
- Sandpaper disks (nonveneered surfaces only)
- Rubber wheel (nonveneered surfaces only)
- Round carbide bur (no. 6 or 8)
- Airborne abrasion unit (with 25 um aluminum oxide)

Step-by-step procedure (Fig. 20-47).

1. Recover the castings from the investment and prepare the surfaces to be veneered as described in Chapter 19.
2. Finish the gingival surface of the pontic. Do not overreduce this area.

Evaluation. Less than 1 mm of porcelain thickness is needed on the gingival surface, because once it is cemented, the restoration will be seen from the facial rather than from the gingival. Excessive gingival porcelain is a common fault in pontic framework design and may lead to fracture and poor appearance (see Fig. 20-28).

To facilitate plaque control, the metal-ceramic junction should be located lingually. Then tissue

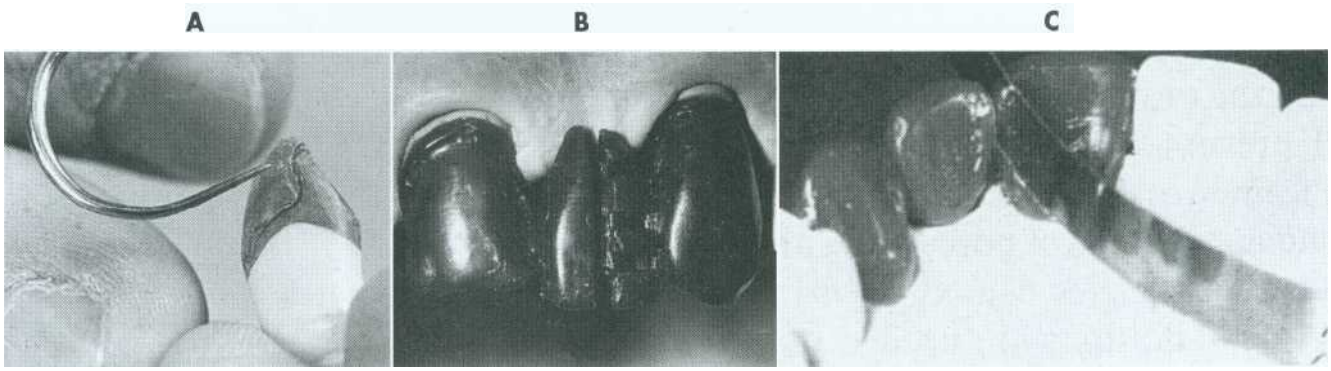


Fig. 20-46. Cut-back procedure for a three-unit anterior FPD. A, Delineating the porcelain-metal junction. B, The central incisor has already been cut back, and the pontic has been troughed. The canine is still at anatomic contour. C, A ribbon saw is used to section the connector.

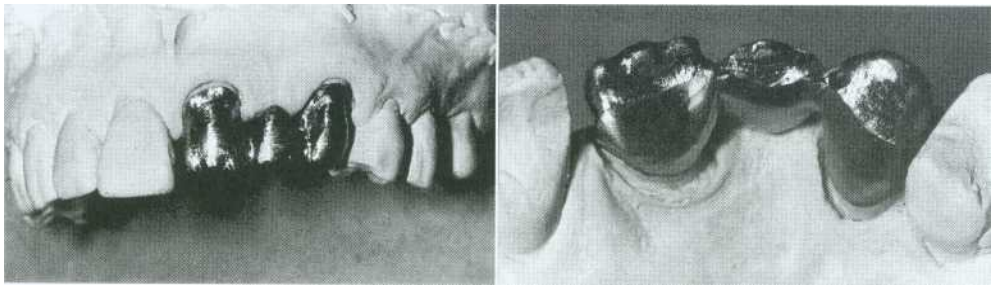


Fig. 20-47. Metal substructure ready for airborne particle abrasion and oxidation.

contact will be on the porcelain and not on metal, which retains plaque more tenaciously.[40]

Porcelain Application. Many of the steps for porcelain application are identical to those in individual crown fabrication (see Chapter 24). There are some features peculiar to pontic fabrication, however, and these will be emphasized.

Armamentarium (Fig. 20-48)

- Paper napkin
- Glass slab
- Tissues or gauze squares
- Distilled water
- Glass spatula
- Serrated instrument
- Porcelain tweezers or hemostat
- Ceramist's brushes (no. 2, 4, or 6)
- Whipping brush
- Razor blade
- Cyanoacrylate resin
- Colored pencil
- Articulating tape
- Ceramic-bound stones
- Diamond stones
- * Diamond disk

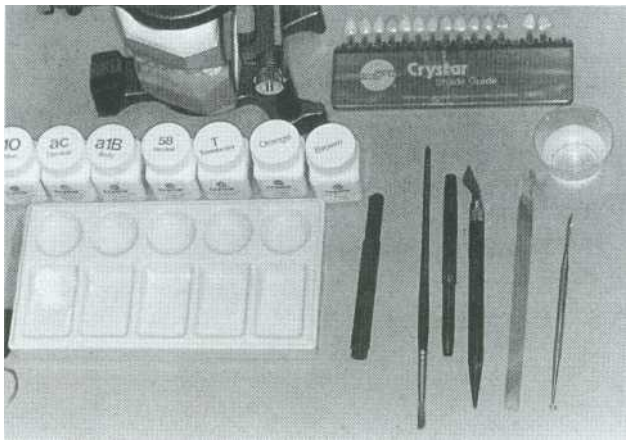


Fig. 20-48. Armamentarium for porcelain application.

Step-by-step Procedure (Fig. 20-49)

1. Prepare the metal and apply opaque as described in Chapter 24.
2. Apply cervical porcelain to the gingival surface of the pontic and seat the castings on the master cast. A small piece of tissue paper adapted to the residual ridge on the cast by moistening with a brush will prevent porcelain powder from sticking to the stone. (Cyanoacrylate resin or special separating agents can be used for the same purpose.)
3. Build up the porcelain (as described in Chapter 24) with the appropriate distribution of cervical, body, and incisal shades. The tissue paper will act as a matrix for the gingival surface of the pontic.
4. When the porcelain has been condensed, section between the units with a thin razor blade. This will prevent the porcelain from pulling away from the framework as a result of firing shrinkage. A second application of porcelain will be needed to correct any deficiencies caused by firing shrinkage. Such additions usually are needed proximally and gingivally on the pontic.
5. Apply a porcelain separating liquid (e.g., Vita Modisol*) to the stone ridge so that the additional gingival porcelain can be lifted directly from the cast as in the fabrication of a porcelain labial margin (see Chapter 24).
6. Mark the desired tissue contact and contour the gingival surface to provide as convex a surface as possible. The pontic is now ready for clinical evaluation and soldering procedures, characterization, glazing, finishing, and polishing (see Chapters 28 to 30).

Evaluation (Fig. 20-50). The porcelain on the tissue surface of the pontic should be as smooth as

*Vident: Brea, Calif.

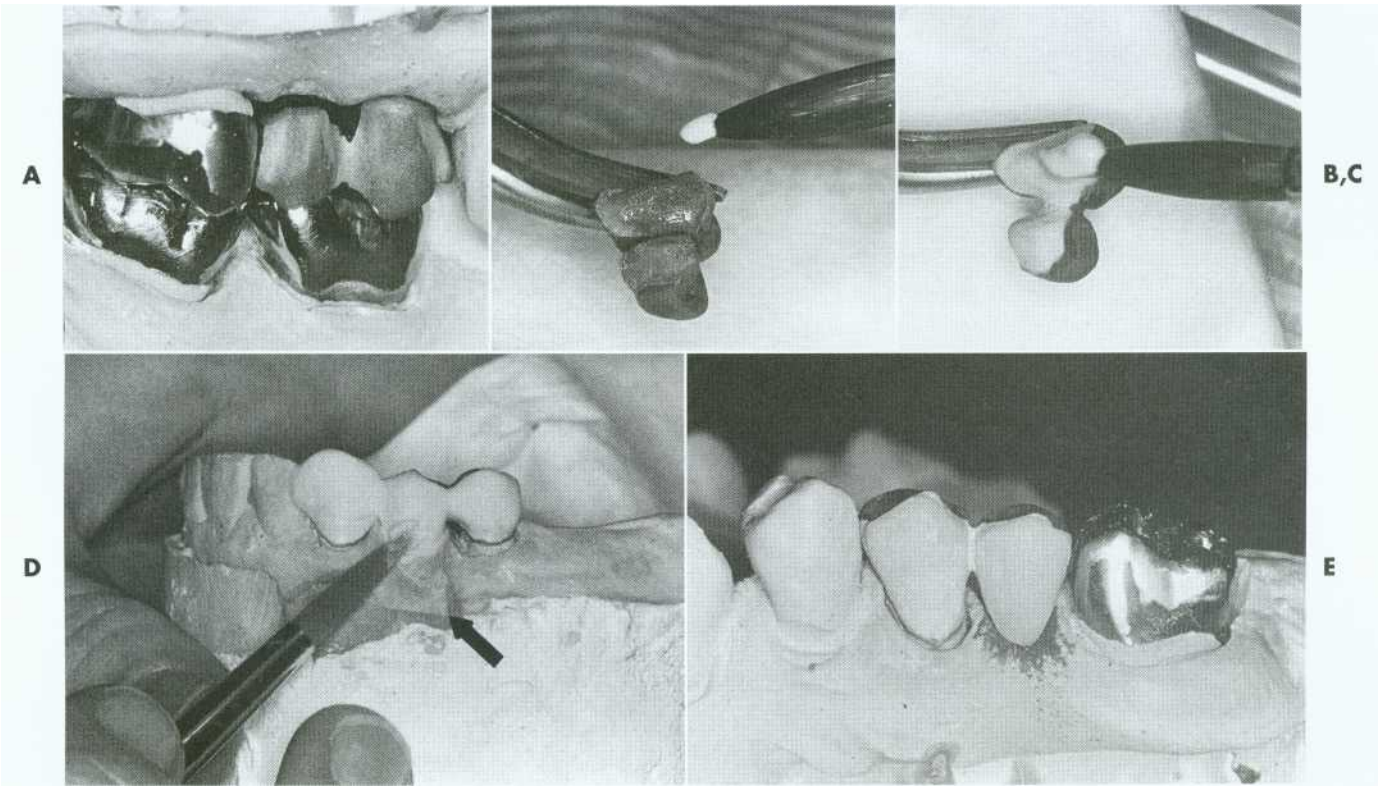


Fig. 20-49. Porcelain application. A, Substructure ready for opaquing. B, Opaque application. C, Body porcelain application. D, A piece of moistened tissue paper (arrow) on the edentulous ridge. E, The porcelain after the first firing.

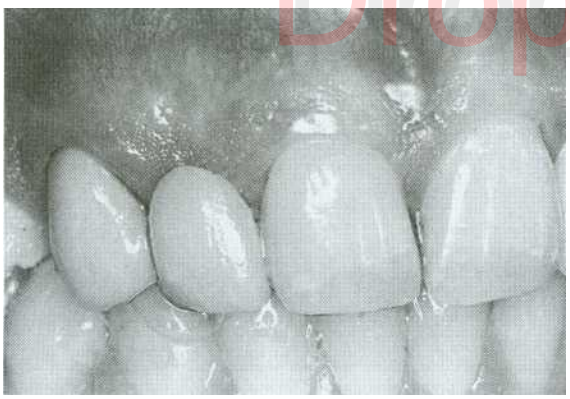


Fig. 20-50. Metal-ceramic pontic replacing a lateral incisor.

possible. Pits and defects will make plaque control difficult and promote calculus formation. The metal framework must be highly polished, with special care directed to the gingival embrasures (where access for plaque removal is more difficult).

ALL-METAL PONTICS

Pontics made from metal (Fig. 20-51) require fewer laboratory steps and are therefore sometimes used for posterior FPDs. However, they have some

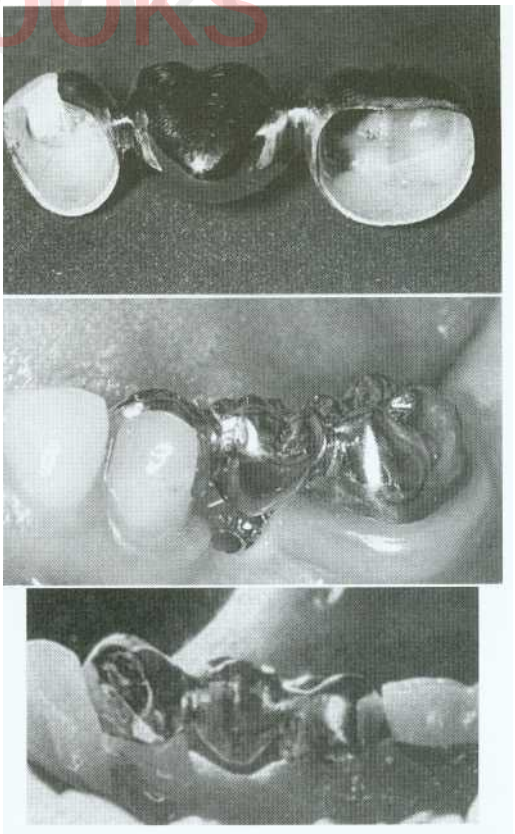


Fig. 20-51. All-metal, three-unit FPDs.

disadvantages (e.g., their appearance). In addition, investing and casting must be done carefully because the mass of metal in the pontic is prone to porosity as the bulk increases. A porous pontic will retain plaque and tarnish and corrode rapidly.

SUMMARY

Designs that allow easy plaque control are especially important to a pontic's long-term success. Minimizing tissue contact by maximizing the convexity of the pontic's gingival surface is essential. Special consideration is also needed to create a design that combines easy maintenance with natural appearance and adequate mechanical strength. When the appropriate design has been selected, it must be accurately conveyed to the dental technician.

There are subtle differences between metal-ceramic pontic fabrication and the fabrication of other types of pontics. Under most circumstances, the metal-ceramic technique is used because it is straightforward and practical. However, it requires careful execution for maximum strength, appearance, and effective plaque control. Alternative procedures may sometimes be helpful, particularly when gold alloys are used for the retainers. Resin-veneered pontics should be restricted to use as longer-term provisional restorations, and all-metal pontics may be the restoration of choice in nonesthetic situations, particularly where forces are high.

GLOSSARY

center of the ridge: the faciolingual or buccolingual mid-line of the residual ridge.

clinical crown: the portion of a tooth that extends from the occlusal table or incisal edge to the free gingival margin.

crest: *n (14c):* a ridge or prominence on a part of a body; in dentistry, the most coronal portion of the alveolar process.

emergence profile: the contour of a tooth or restoration, such as a crown on a natural tooth or dental implant abutment, as it relates to the adjacent tissues.

hygienic pontic: a pontic that is easier to clean because it has a domed or bullet shaped cervical form and does not overlap the edentulous ridge.

modified ridge lap: a ridge lap surface of a pontic that is adapted to only the facial or buccal aspect of the residual ridge.

pontic: *n:* an artificial tooth on a fixed partial denture that replaces a missing natural tooth, restores its functions, and usually fills the space previously filled by the natural crown.

residual ridge: the portion of the residual bone and its soft tissue covering that remains after the removal of teeth.

residual ridge crest: the most coronal portion of the residual ridge

residual ridge resorption: a term used for the diminishing quantity and quality of the residual ridge after teeth are removed.

Ortman HR. Factors of bond resorption of the residual ridge. J Prosthet Dent *1962; 12:429-40.*

Atwood DA. Some clinical factors related to rate of resorption of residual ridges. J Prosthet Dent *1962;12:441-50*

ridge augmentation: any procedure designed to enlarge or increase the size, extent, or quality of deformed residual ridge.

ridge crest: the highest continuous surface of the residual ridge not necessarily coincident with the center of the ridge.

Study Questions

1. Outline and discuss a logical classification of pontics.
2. How does pontic design change as a function of location in the dental arch?
3. What are the materials available for pontic fabrication? What are their respective advantages and disadvantages, indications, and contraindications?
4. Discuss the factors that govern the shaping of the facial and lingual surfaces of a modified ridge lap pontic.
5. What common clinical problems might be encountered if a pontic is improperly shaped or fabricated?
6. Discuss the various techniques for soft tissue augmentation and the residual ridge defects they are designed to resolve.
7. What factors should be considered when selecting the pontic material that will be in contact with the residual ridge?

ridge lap: the surface of an artificial tooth that has been shaped to accommodate the residual ridge. The tissue surface of a ridge lap design is concave and envelops both the buccal and lingual surfaces of the residual ridge.

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